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# Lady Argiope: Merciless Genius

*By* HIRAM JEFFERSON HERBERT
*Illustrated by R. Bruce Horsfall*

DOWN the stream from the quiet pool raced the dragonfly. Her body was tired and worn, for her efforts of depositing the eggs of another generation had been completed only a few minutes before. Although aware of her now tragically limited life, she was happy—for she had contributed her debt to the world that had offered her the pleasures of existence. Now she would spend a few days in happiness, deriving from Mother Earth the glamor of sunny, peaceful days.

So, down the stream amongst the trees and the vines she sailed on wings that were beautiful, yet torn. Perhaps her senses had been somewhat dulled by the arduous task she had recently finished . . . for she abruptly stopped in the air above the stream. As if a flexible, invisible wall had been flung across her path, she found herself halted, unable to continue her progress. She was aware of fine, sticky ropes entangling her. Her wings beat pitifully against these tenacious shackles, her feeble legs jerked and rent and tore—but vainly.

As she struggled, realizing the hopelessness of her attempts, she became aware of eight gleaming eyes growing in size and ferocity as they approached her. Like a battery of great blinding lights, they rushed upon her. There was a flash of billowing white, a meshed blanket of silken ropes was being flaunted by this rapidly advancing, gay-colored demon. With a suffocating imprisonment, this blanket fell about her. She was totally defenseless, now; a sharp stab in her back, between the roots of her straining wings, stung like fire. She began to wilt, the abdomen curled in agony, and her legs clutched each other in the apparent throes of death. She knew no more.

Haughty Lady Argiope had struck! With the unfailing cunning of her kind she had, like *retiarius* in the ancient arena, flung her net; and then, realizing the great size of the captive as likely to cause trouble, she had, on the order of *bestiarius,* polished off her job with stabs of tridents—her lethal fangs. That had proved sufficient.

The gorgeous elliptical web of Lady Argiope, *Argiope aurantia,* called the garden spider, with the yellow and black on her plump abdomen and the brown-shaded rings of her legs, had been just about ruined with the capture of a furious locust two days previously. She dragged the enshrouded locust, bumping at her heels, to her resting mat in the center of the web and sucked the juices from its body. The next night she constructed a new trap.

Early one evening she had ascended to a coign of vantage on an alder bough. Here she sat, pondering. Occasionally, she stretched her legs. Otherwise, she was inactive. She was "mentally" designing her cunning device with which she captured her food. The art of the ages went into this process: chemistry, architecture, geometry, engineering, mechanics, spinning, weaving—and logic! All of these applied sciences for the mere purpose of snaring a fly!

The movement was probably a sigh: "Well, young lady, let's go!" Forthwith, she touched the tip of her body to the bough, thus affixing a few guy-wires of silk.

"DOWN THE STREAM FROM THE QUIET POOL RACED THE DRAGONFLY. HER BODY WAS TIRED AND WORN . . ."

Now she dropped like a plumb-bob toward the stream below, leaving behind a glistening, thin line of silver. As the silk was paid out from her abdomen, the weight of her falling body drew it out and her spinnerets governed the flow, the size and the texture. When she had reached a point only four or five inches above the stream her spinnerets acted as a "brake," she halted easily, remained slightly swaying . . . and now she swung about to begin climbing the strand she had spun. As she pulled herself upward in a sort of hand-over-hand application, her two hind legs pulled the silk from her body. When she reached the point of beginning, she waited until the slight breeze had swung the looping strand to a convenient leaf-stem. Satisfied, she attached the strand to the bough and ran down to anchor the caught end. Along these double cords she worked at incredible tempo, reenforcing this "cable," which was to be permanent, as well as her base of operations.

Now she spun from this cable various lines, so that the structure was attached to the branches and the resultant shape roughly polygonal. With this accomplished, she was able to travel over her field of endeavor, instead of "falling" in order to reach a desired point. She busied herself with running crossbars. The affair was taking definite shape where not so long before was void. At this point she committed a very peculiar act: beginning in the center of the web she spread, instead of a tiny strand, a zigzag ribbon of silk—as if she was purposefully inscribing her signature to this work of art!

In the spiral web that is fitted from spoke to spoke—or, the radial threads—can be found some of the most amazing peculiarities. To the naked eye, a strand appears to be a "single strand." Really, it consists of several twisted strands. Under the microscope broken ends are seen to be tufted, like numerous broken fibers. Not only that but other striking features are present: the silken strand is covered with a viscid white fluid. Herein lies the secret of the tenacity of a spider's web, a net that is a perfect lime-snare. Whenever an insect comes in contact with this effective contrivance it adheres, rarely being able to release itself. If the captive pulls at the clutching silk, the silk stretches to three times its original length; and unless it is gripping too tightly, will contract to its intended size when freed.

After observing the remarkable success and efficacy of this Catherine-wheel it is only natural to puzzle over the fact that the spider is not caught in her own web! Does Lady Argiope weave separate and certain strands that do not contain this glutinous substance, and with which she is justly familiar . . . thereby avoiding the dangerous ones?

No. She is astoundingly adapted with the means to produce an oily film that covers her legs! This makes her immune to the fatal snare. She dashes about at will, at work and in battle, with never a worry over becoming trapped. Usually, she rests in the center of her web where she has laid down her fairly thick pad of fluffy silk. She is, unfortunately, purblind; but with her creation this deficiency was compensated for by an incredible sense of "feel." Often enough, a victim will become foiled at the outer extreme of the web, at which distance it cannot be seen by the spider . . . but its cavortings and struggling will shake the web: thus transmitting its fate to the lurking mistress of the flossy tapestry.

So it came to pass that Madame Dragonfly sailed down the quiet stream amongst the alders and the vines, unsuspecting and happy. Thus was it that Lady Argiope waited in her bower; and thus did the dragonfly crash

"WHEN SHE HAD REACHED A POINT ONLY FOUR OR FIVE INCHES ABOVE THE STREAM HER SPINNERETS ACTED AS A 'BRAKE' . . ."

into the sticky tentacles of the spreading net. When her victim was almost quiet, Argiope went to her, attached her reel of silk to her body and proceeded to roll her across the web. By so doing, the silk wound around and around the victim's body, fastening down the wings and the legs! Then she gripped it with her two hind legs, and dragged it along to her banquet hall!

However, the dragonfly was not what might be truthfully termed dead. It was barely living, though. Lady Argiope is bloodthirsty. From the feebly pulsing body she will suck the fluid. Then she will toss the drained carcass away.

In the struggle the web was severely torn. Of course, this is what she expects. Since it will necessitate the construction of a new one, this is where she convinces us of her economy, for she wastes nothing. The web, all except the framework, will be consumed for the manufacture of more silk!

Not so long ago I was talking about spiders with my friend, the county surveyor. I happened to remark that I could detect no commercial value contributed by the spider.

"Oh, yes," he replied. "An efficient surveyor's transit, before the invention of finely-divided platinum, would have been impossible had it not been for the strands from a spider's web . . . which were used for cross-hairs!"

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# Country Hill Field

*By* JANET MATHEWSON

Though worlds should crash and white-hot stars should fall
In lightning spirals down the heavens' stair,
And men seek vain escape, and curse and call,
And wild disorder triumph everywhere—

Still it would seem as though this country field,
Touched with the buttercup gold of afternoon,
Would yet remain, each daisy still a shield
Of brave and constant white around its moon!

No clamors of the sweating throngs will seize
This slender wind that runs across the hill,
Runs swiftly like cloud-shadows toward the trees,
And bends the grass, and ripples, and lies still.

Here in this quiet field so far from town,
Here where the bluebell lifts a turquoise crest,
I have seen fear and loneliness roll down
Like pebbles in the grass, and come to rest.

And griefs, long old, the heart remembering
Would run away from, far beyond recall—
All griefs will stop to hear the wild birds sing;
No sorrow ever scales the field's stone wall.

And half-forgotten loves of long ago,
Persistent following ghosts, will run and hide;
And wind will sway past softly, soft as snow,
And wind will gently brush the grass aside . . .

FATHER STORK STANDS GUARD WHILE HIS LADY FORAGES FOR FOOD

The stork parents share the task of incubating the eggs and rearing their families, one taking charge of the nest while the other feeds and obtains food for the young

# Meet the Danish Stork

*By* JULIUS MORITZEN

In a number of his fascinating wonder-stories Hans Christian Andersen pays poetic tribute to the stork of his native Denmark. The famous story-teller endows this dignified biped with a personality, and gives his imagination free rein in those tales that are as popular today as they were more than a century ago.

Another Dane has dealt with the life of the stork. He is Dr. P. Skovgaard, European ornithologist, and his picture of the Danish stork is scarcely less fascinating than that of the writer of fairy-tales. For a quarter of a century Dr. Skovgaard has devoted himself to learning about the stork's intimate family life, the rearing of its young, and its migrations to and from the little country between the Baltic and the North Sea. He has visited all the sections where the birds have settled, either in pairs or in colonies. The fact that the storks are decreasing in Denmark has spurred Dr. Skovgaard to even greater activity in assembling data.

It is well known that the stork is protected wherever it makes its home. It becomes virtually a member of the farmer's family wherever it graces the roof-tree or builds its nest. There is a bond of understanding between the Danish country folk and their feathered guests. They are as much a part of the Danish seedtime and harvest as the recurring seasons that see the storks depart for warmer climes in autumn, and return in the Scandinavian springtime.

"The stork," writes Dr. Skovgaard, "is among the first things to enter our child-consciousness. We get to know the characteristic bird through fairy-tales and stories about what it does. In imagination we can follow its actions, hear it talk to its mate, and even if we do not understand its language we know that it is something of importance that causes all these gesticulations."

Early in life Dr. Skovgaard felt it a duty to study the daily life of the stork and record it in words and pictures. To do this he sought information from all parts of the country; examined hundreds of nests with their young; banded them; watched the antics of the parents. He found the feeding period one of the most interesting activities to observe, because of the eager appetites of the young. It is no small matter to supply the stork family with enough tempting and satisfying morsels.

In fact, Dr. Skovgaard assigns as one possible reason for the decrease in the number of storks in Denmark the more intensive cultivation of the soil. Drainage of former swampy sections robbed the stork of one of its best hunting grounds. The natural homes of frogs and snakes are

getting fewer and fewer. Cutting down the food supply increases infant mortality as much with storks as with humans. Bugs and worms may do in a pinch, but they are not nearly so filling as larger items on the stork menu. As near as it has been possible for Dr. Skovgaard to find out there are today less than a thousand storks in all Denmark. The large colonies of fifty pair or more belong to bygone days.

"Nothing is more fascinating," writes Dr. Skovgaard, "than to watch the growth of the baby storks; to observe their first attempts to keep their balance on their long legs; to enjoy their flying exercises and autumn maneuvers. Then, one fine day, we stand with the empty feeling that our friends have left us. Little by little we try to follow them on the long way southward, which is nothing more to us than a line on the map. Gradually they slip from our thoughts into a dim land. Then, with the coming of spring, they are once more a reality right in our midst; their splendid white figures resplendent in the Danish sunshine. And next they are assuming their old tasks as a mere matter of course."

TWO YOUNG BIRDS IN THE NEST AWAIT FOOD BEING BROUGHT TO THEM BY THE ARRIVING FATHER.

THE MOTHER BIRD CALLS LOUDLY TO HER OFFSPRING JUST BEFORE SHE ALIGHTS ON THE EDGE OF THE NEST.

The stork that arrives first in a village where there are other nests begins at once to use these to save itself the trouble of seeking further for material to repair its own domicile on which other birds already may have been at work. Jackdaws help themselves to the stuff of which the empty stork nest is made. And, in turn, the returned stork will steal sticks from the crow and magpie nests in the neighborhood. It is curious that, despite many empty nests, storks will engage in a furious battle over some particular nest that strikes their fancy. Fights over a female are also common, and if a stranger is the victor he at once empties the nest of its eggs or young.

To witness the first meeting in the springtime of a pair of old storks is to get the impression of a happily-mated couple greeting each other after a separation.

"Long before we suspect that there is a stork approaching the mate in the nest begins to get busy with the liveliest kind of chatter-

ing," says Dr. Skovgaard. "It basks with open wings; it gesticulates as only a stork can gesticulate. Gradually, as the arriving bird comes within hearing, it sends down its call from a great height. Before landing on the nest it performs all kinds of antics, joining its mate in 'conversation' for a considerable time."

As a general rule both the male and female stork take turns in brooding. This, however, is frequently interrupted in order to get the healthiest kind of young. The eggs are turned, or moved about, the nest is stirred and aired to make the bed as soft as possible. The brooding stork generally looks after its own food when not sitting, but now and then one goes in search of tidbits for the other.

Building a stork nest is a piece of bird engineering, a continuous process until, after several seasons, the nest may be of such monumental size that it topples over from its own weight. The nest often is protected with briers on its outside to discourage uninvited guests. Sparrows, however, consider this a good homesite, and pigeons and owls have been known to select the outer layers of the nest as headquarters. The sparrows, in fact, live in armed neutrality with their big neighbor, who now and then makes a thrust with its bill through the loose sticks in the hope of securing an extra meal.

**READY TO TAKE FLIGHT**

Young birds about ready to make the first attempt with their large but untried wings

While the stork is under the protection of man, there are other dangers. From the moment it leaves the egg its existence is perilous. Martens, pole-cats and rats seek both eggs and young. Fires sometimes destroy an entire stork family. There is a case on record of the stork carrying its young, one by one, to a place of safety when fire threatened the nest. Electric wires claim many victims, especially during the first migratory flight of the inexperienced young storks. Some storks are poisoned by eating moles killed by arsenic that the farmers have scattered to kill burrowing animals.

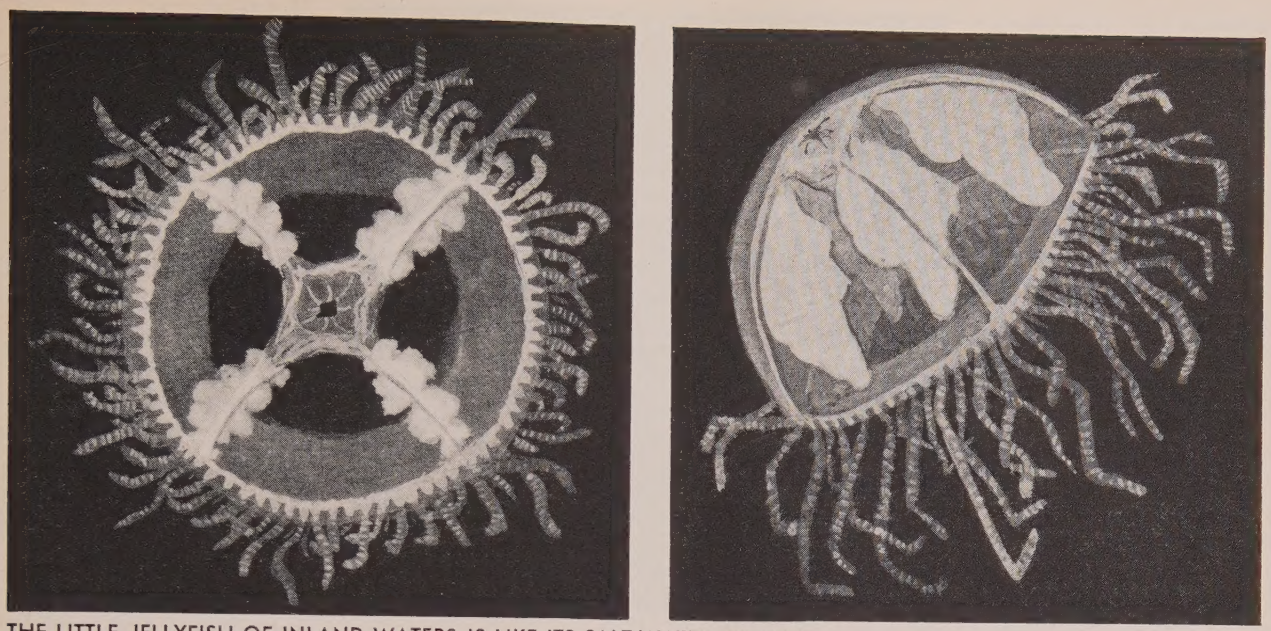
Hailstorms frequently play havoc with the storks, particularly those entering upon their initial migrations. Dr. Skovgaard relates a catastrophic incident of this kind in Natal, South Africa, where storks were assembled in numbers ready to start northward in February, 1931. After the hailstorm was over the ground was scattered with dead and dying storks that never were to reach their homes in Germany, Holland, Poland, as well as Denmark.

The impression is general that the family life of the stork is ideal; that monogamy is the rule, rather than the exception. On this Dr. Skovgaard says: "The rejoicing of the mates at their reunion, and the widowed stork's year-long watching of the old nest, have been taken as evidence of the true relationship that exists between a mated couple. Now, one stork looks very much like another, so it is not so easy to know just what is the situation in a given instance, but close observations do show that, in the case of storks, as in the instances of other creatures, some enjoy a long harmonious existence together while others take a different view of marital obligations. I know of a nest with a pair of storks and another nest nearby with a single male. The two males took turn about standing watch over the hatching female. When one was away on a foraging expedition the other took his place. Although there were six eggs in the nest nothing came of it.

"In another place a male and a female stork each had their own nest. The female was hatching out a batch of eggs when the neighbor paid her a visit. In the belief that he had come to aid in the hatching she went in search of food, but that was not the intention of the male who returned to his own nest.

"Polygamy among the storks is not uncommon, and there are plenty of examples of the widower, or the widow, quickly recovering from the period of mourning. In one instance the female was killed by an electric wire during the hatching period. After the male had been sitting on the eggs a few days he obtained another partner. It is my opinion that changing mates is not an unusual occurrence, but, on the other hand, there are storks who are faithful to each other year after year in the same nest."

For the benefit of those who may never have seen one of these unique birds, Dr. Skovgaard describes one as follows: "It is completely white, with a red beak and long red legs. It has black wing coverts that reach about two inches beyond the tip of the tail when folded. The legs are naked from the heels up to where they disappear in the plumage of the body itself. The wing-spread averages a little more than two yards. The height of the bird is about twenty inches to the shoulder. The craw is covered with feathers used to hide the bill when at rest."



THE LITTLE JELLYFISH OF INLAND WATERS IS LIKE ITS SALT-WATER RELATIVE

Viewed from above the denser portions of their bodies form a Celtic cross. They are a little less than half a walnut shell in size with a fringe of flexible tentacles wavering about the rim

# Jelly-fish of Inland Waters

*Graceful and as lovely as spring flowers, they are common yet not often seen*

*By* FRED SCHUNK

SALT water taffy, sand and jellyfish are inseparable in the minds of nearly every visitor to the seashore. However, it is not unusual for the candy to be made in kitchens no nearer to the sea than Philadelphia, while at least one jelly-fish is a fresh-water species found even in the lakes of prairie states. In fact, when placed in salt water this odd coelenterate almost instantly collapses and soon dies. Fifteen minutes in salt water is surely fatal.

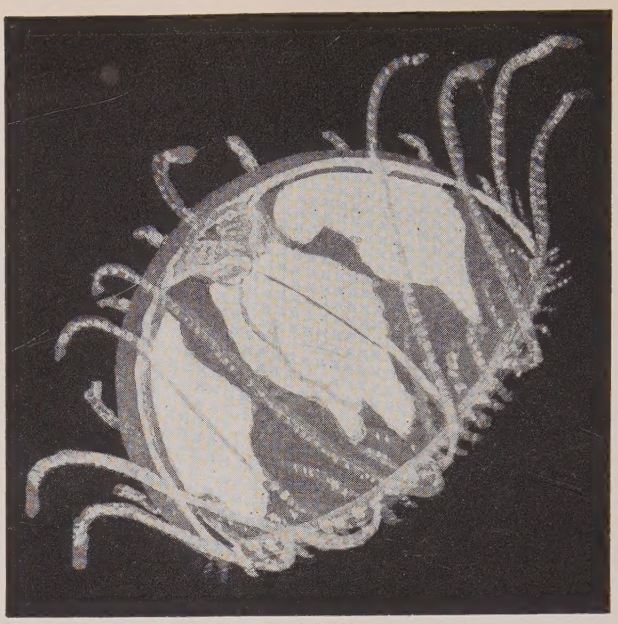
During June of 1880 small active jelly-fish were found swarming in the lily tank of the Royal Botanical Society in London. Up to that time no fresh-water jelly-fish was known to exist, and this abundant supply caused great interest among scientists both because of the unique habitat and certain peculiarities of behavior. At first it was thought that they had been introduced on the roots of the large South American water lily, *Victoria regia,* but later the species was found in places where no lilies ever had been planted. It was found at Lyons, France, in 1901, at Munich in 1905, and, two years later, near Washington, D. C. Since then it has been found in at least nine states.

From the number of stations and their wide distribution, it is probable that the fresh-water medusa is a fairly common species, but as yet scientists are delighted when they find it, and quickly report the discovery in their periodicals. So far it has been collected in Pennsylvania, Georgia, New York, Louisiana, Kentucky, Oklahoma, Michigan, Illinois, Iowa, and the District of Columbia. Thus the native of any of these states or districts is privileged to look bored when the traveler tells him of the wonders of the sea, and may remark that equal curiosities are found in the local reservoir or swimming pool, or in Mr. Jones's goldfish pond.

The species has no common name, but "fresh-water" defines it well enough, and more easily than the Latin name of *Craspadacusta sowerbii.* They are among the smaller jelly-fish. They can not vie in size, for instance, with the sea blubber, that monstrous mass of hyaline jelly with tentacles trailing perhaps a hundred feet, and with a bell known to reach seven and one-half feet across its open end. Nevertheless, they are real jelly-fish in form and function, with stinging, poisonous arrows for attack and defense, with graceful, swaying tentacles, and with a transparent anatomy understandable at a single glance. Sudden pulsing contractions of the whole body, expelling jets of water, sends each one moving through the water in orthodox jelly-fish style.

Though they are small, these are not the smallest of their kind. Many marine forms are only half as large. In appearance they resemble the common moon jelly of the sea. Each is an entirely transparent hemisphere, a little less than half a walnut shell in size, with a fringe of flexible tentacles wavering about the rim. We may compare them to a bell, complete with clapper. The part corresponding to the bell clapper is the mouth or manubrium.

Jelly-fish are carnivorous. Captured copepods and such are quickly seized by greedy lips and forced up into the body cavity. Four radial canals carry the food to a canal encircling the rim or velum. No part is more important than this velum. Here are located the sense organs, the statocysts, the greater part of the nervous system, and the tentacles. A double row of nerve cells, one above the other, direct the voluntary movements of the animal. Remove the velum and the jelly-fish stays motionless until subject to some external excitement, when it will give a single convulsive throb. All the organs are easy to see. They are dwellers in glass houses, concealing nothing.



**LIKE A BELL WITHOUT A CLAPPER**

**The tentacles are thickly armed with minute, curled-up poison darts for paralyzing prey**

The tentacles of jelly-fish are thickly armed with minute, curled-up poison darts, which, when excited, spring out to pierce and paralyze the prey. Touching one of the larger species is like contact with a heated iron, as many ocean bathers know too well. The unfortunate victim may become seriously ill, and a scar is often produced that lasts for months. Luckily, our fresh-water medusa is too small to harm so thick-skinned a creature as man. Still, it is not entirely harmless. As an experiment we placed a dozen in a tank. A goldfish quickly seized one, but immediately spewed it forth, giving every indication of pain and dismay. For a long time the fish was over-excited and kept rubbing his burning lips against the glass sides of the jar. Since even the small brown hydra is able to kill fry with its "arrows", it is better to keep *Craspadacusta* out of aquariums containing tropical fish.

Wherever found these jelly-fish have proved erratic in appearing and disappearing. Though a sun-loving species, great numbers were found thriving in a slow sand filter in total darkness. Elsewhere they have appeared in streams, in rivers, in all sorts of reservoirs, tanks, and aquaria. Some were even seen in two connected potholes on the shores of the Potomac. The season in lakes is mainly August and September, but indoors they have been gathered as early as June and as late as December. In the Panama Canal zone the earliest, or latest, record was in January.

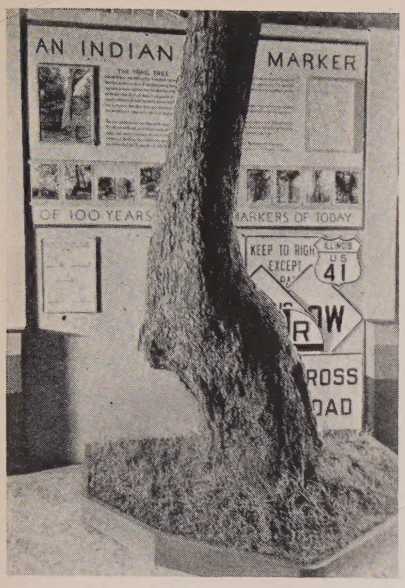
Recently they were found for the first time at Lake Winola in northeastern Pennsylvania. As elsewhere they were present in enormous numbers. Lake Winola is one of many kettlehole ponds of glacial origin that are widespread in northern America. The water, forty feet deep in parts, is extremely clear. Perch and pickerel can be seen deep below swimming through an aquatic jungle of bright-green hornwort and shellac-brown pondweed. Wherever the sun can reach the bottom there are similar plants. At one time the shores of the lake were covered with a hemlock forest. A few of these tall trees remain even now, but summer cottages are the most common growth.

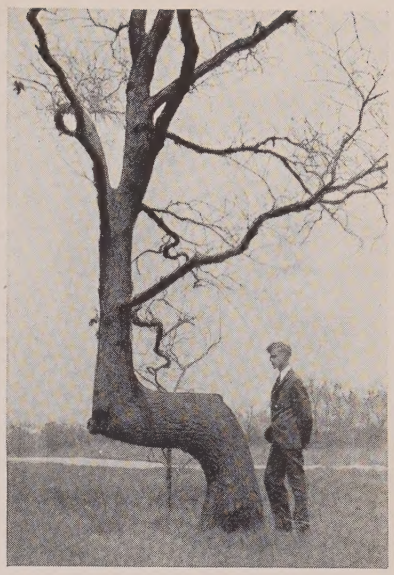
Throughout September there were thousands of jelly-fish each day swimming near the surface, attracted by the sun. We collected all we wanted easily with a net. From our boat we could see them ten feet down, and misty like faint stars. Pulsations as regular as the human heart's forces them upwards towards the boat, while the current carries them on out of sight. Rarely do they appear singly. On the sunny side of the lake their numbers were amazing. They came by in constellations and in clusters. After sunset movement ceased and they sank slowly towards the bottom.

Unique in their charm, these jelly-fish, in spite of small size, are remarkably conspicuous. Viewed from above, the denser portions of their pellucid bodies form a Celtic cross surrounded by a ring. There are few things like them in our larger world. Usually to find such oddities we must travel with a microscope among the minute. They have all the charm of the completely exotic. Here is a thin glair of gelatinous fiber, a double layer of clear protoplasm, 95 percent water, yet traveling and breeding, and even prettier than spring flowers.

Dangling down from the radial canals, like bottle-green draperies, are the gonads or organs of reproduction. This gives us a clue as to why the medusae have appeared so suddenly in such large numbers. They are spawning. Soon after they have ceased discharging egg and sperm into the water, these frail swimmers will disappear forever. Young jelly-fish, hatched from the eggs, will replace them, but in a form superficially similar to the hydra and attached to plants. In this stage they are known as hydranths. Thus the life history is made up of two alternating forms—the vegetative or hydranth fastened to plants, and the sexual or medusoid, which we see swimming freely near the surface. Little is known of the fresh water hydranth. At maturity it gradually transforms into the more familiar swimming sort.

The art of drawing pleasing forms has been defined as the art of varying; jelly-fish then are among the best works of a Master artist, for there is a perpetual blending and variation in their outline without a trace of stiffness. With them swimming is such a pretty, graceful rise and fall! Hogarth believed that the ordinary business of life is performed in straight lines, but that all that is poetic is done in curves. If so, jellyfish are poetic.





**THEY MARKED THE ROUTE OF THE RED MAN IN A BYGONE DAY**

Left to right, an Indian trail marker and some of the many modern signs along the way. Rings indicate the tree was bent in about 1810. Next an old elm near Genoa, Illinois, preserved and marked for its history. Last a fine example of Indian trail sign near Fox Lake, Illinois

# INDIAN TRAIL MARKERS

*By* RAYMOND E. JANSSEN

*Photographs by the Author*

THROUGHOUT that broad part of the earth now known as the United States, there once existed an intricate network of Indian trails. In a sense, these were not unlike the present system of railways and surfaced roads now used by the white man. Indeed, many of our existing routes have been laid out upon the identical paths used by the red man hundreds of years before.

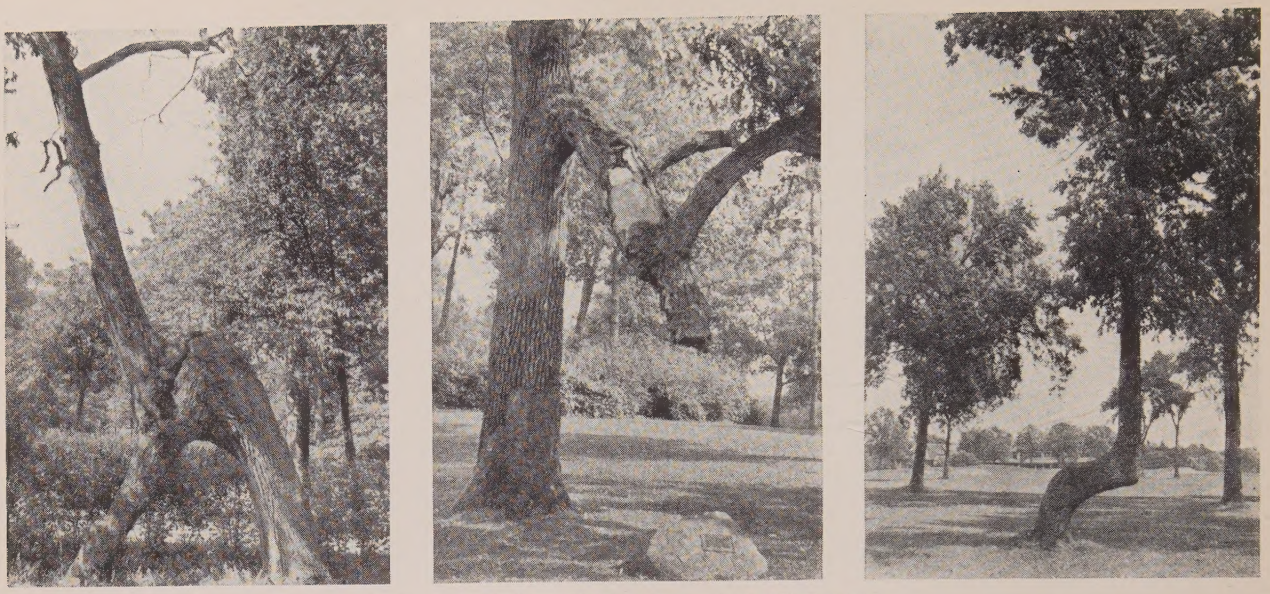
While speeding across the country in our streamlined motor cars, we may see here and there, if we are unusually alert, a few last remaining landmarks indicating the former position of old Indian trails. These exist in the form of curiously bent trees purposely deformed by the Indians to mark pathways through the forests. Now gnarled with age, many may still be found bent just as they were left by the passing red man.

Primitive man, travelling largely by foot, often found need of signs or markers. Tribes inhabiting forested regions knew that trees could be used as reliable landmarks; hence a system was developed whereby young trees were bent and secured in position so that the direction of bend indicated the direction of the route. In establishing a marked trail through a forest, the Indians selected young saplings that could easily be bent without breaking the main stem. These were securely fastened, and the trees continued growing, forever maintaining their bent positions. The Indian knew that trees grow up from their tips; also that usually they do not turn on an axis while growing, but that once established they maintain a constant fixed position. Thus it was possible to deform a young tree so that it would not only stand out from its fellows, but would also be constant as a direction sign.

The methods of securing the

**UNUSUAL INDIAN MEMORIAL PRESERVED BY THE D.A.R.**

Indian trail tree at Evanston, Illinois. Development made its removal necessary and it was thus marked and saved for a few years



TRAIL MARKERS BEHAVED IN VARIOUS WAYS AFTER THE INDIANS HAD BENT THEM

The white oak at the left acquired two sets of roots. When no saplings were available the Indians bent the lowermost branches of larger trees, as in the center. Right, a distinctive marker on a golf course at Highland Park, Illinois

trees in the desired position varied with the customs and ingenuity of the individual and the materials at hand. Sometimes the trees were bent and weighted down with a rock; sometimes the stem was pushed into the ground and covered with a pile of dirt. More frequently, however, the trunk was "hitched" with a strip of rawhide, a sturdy vine, or a tough strip of bark. Such a fastening would rot away after a season or two, but by this time the position of the tree was fixed.

The bending and fastening of young trees had a serious effect upon their later development. Observations of growth rings on such trees indicate that severe stunting occurred. Consequently their sizes are not as great as normal trees of the same age. In being bent, the original main stem was turned downward, and as a result it was necessary for the young tree to establish one or more secondary stems to take the place of the original one no longer able to function normally. Leaves and branches grew on new upright limbs of the secondary trunks. In course of time that portion of the original trunk that was no longer in a direct line between the roots and the leafing branches usually atrophied and decayed away. In rare instances the former tree tip took root at its point of contact with the ground, the tree using two sets of roots.

The selection of saplings for trail markers was dependent upon the type of growth existing along the desired route. Various kinds of hardwood trees were used, such as oaks, elms, hickories or maples. Coniferous trees seem not to have been used inasmuch as their trunks are not susceptible to easy bending near the ground. The Indians did not select trees in the sense that one trail might be composed entirely of oaks, another of elms, and so on. The selection was dependent entirely upon the kinds of trees growing along the route. Consequently trails have been observed in which the markers consist of several types. In some regions, however, such as the Chicago area, where the dominant forest growth at the time of Indian occupancy consisted of oaks, a trail might contain the same variety of tree throughout. Occasionally, too, it was necessary to establish a trail marker at a point where no young sapling happened to be growing. In such cases the Indians resorted to bending the lowermost branch of a larger tree.

Old Indian trail markers are still growing throughout much of the Mississippi Valley, and in the eastern and southern parts of the United States. This method of marking trails was in use by the Indians when the early explorers and settlers first arrived in America. As the Red Man was pushed farther and farther westward, he left behind him his forest trails, often marked by these curious guide-posts. The ravages of time, as well as the necessity for local land improvements, take their toll from these ancient landmarks as the years pass. At the present time, they are most numerous in the area about Chicago.

Care must be taken to avoid confusing the many twisted, crooked, and malformed trees of the forests with Indian trail signs. Wind storms, lightning, sleet, heavy snows, and injuries by animals may cause deformities in trees that, at first sight, might be mistaken for the handiwork of the Indian scouts. However, such accidental deformities may be detected by careful observation, and one can learn to distinguish between them and the methodical bend used by the Indians. In any event, a series of similarly bent trees pointing successively toward each other precludes the possibility of accidental deformity.

It is unfortunate that these old Indian trail trees are fast disappearing. When many of them were bent this country was a forest wilderness, and the United States was not yet a nation. During the intervening years the Indian trail has been supplanted by the railroad, or the concrete highway, and the soft tread of moccasined feet has given way to the whirr of streamlined trains and motor cars. Throughout this changing panorama of events, the trail trees have continued to grow, ever faithful in their duty of pointing out the trail just as they did when first bent many years ago.

# The Quest For Galax-Leaved Shortia

*By* MARGUERITE YANCEY

LOST—A galax-leaved plant that has been seen in an herbarium in Paris, but which is native to only two regions in the world—the mountains of North Carolina and Japan.

BETWEEN the years 1839 and 1879 such a message as this might have been broadcast to all botanists whose activities took them into the Appalachian region of North Carolina. A little plant, discovered in 1788 by the great French botanist, André Michaux, and taken home with him, had been lost to this country.

An interesting and romantic story is that of the discovery and re-discovery of the galax-leaved shortia, a showy white-blossomed plant that resembles the Swiss edelweiss. André Michaux found it while he was collecting plants, particularly trees and shrubs, for the French government. He came to this country in 1785. One of his first labors was to establish in the interests of his sponsors two extensive nurseries of arboriculture; one near New York City, and the other near Charleston, South Carolina. But his most important work was his rich collection.

Over much of eastern North America, from Florida to the Hudson Bay, then an unbroken wilderness, he travelled and searched for plants, some of them destined to ornament the gardens of Versailles. He was particularly active in the Appalachian Mountains. Later, after his return to France, he established a botanical garden in Madagascar, and there he died, in 1802.

A year after Michaux's death, L. Richard, a fellow-botanist, prepared his *Flora Boreali Americana.* Based on Michaux's extensive collections made in the United States, this work contained mention of the plant now known as *Shortia.* The note stated only that it had been collected in the mountains of North Carolina.

It was years later in 1839 that Asa Gray saw this specimen in Michaux's collection in Paris. He ventured to found a genus upon the imperfect specimen, naming it *Shortia,* in honor of Charles W. Short, a Kentucky botanist. Gray hoped that diligent search by botanists visiting the type region would bring more specimens to light. Little did he think that this search was to last almost forty years, and as the years passed by without result, doubt as to the origin of the plant arose in the minds of everybody engaged in

BLOSSOMS AND LEAVES OF THE GALAX-LEAVED SHORTIA

This excellent photograph of the long-lost plant was made by J. S. Dendy of Brevard College, Brevard, North Carolina

the search. But in 1868 Dr. Gray was able to announce that the genus had been discovered, "not where we were looking for it, but where experience had led me to expect that any or every peculiarly Atlantic States type might occur, namely in Japan." However, Michaux's plant had been found when in fruit and the type of flower had to be conjectured from sketches of its near relatives supplied by the Japanese. Not until 1879 did Dr. Gray see an actual flowering specimen of *Shortia galacifolia.* This came to him from Mr. M. E. Hyams of Statesville, North Carolina. His young son had collected the plant on the banks of the Catawaba River in McDowell County, east of Black Mountain.

*Shortia* grows in a dense mass, spreading from underground runners, yet the area over which it occurs is restricted. Dr. Gray suggested the possibility that, since in the struggle for life of two allied plants the weaker must go, *Shortia* was being crowded out by its stronger cousin, *Galax.*

*Shortia* had never been successfully grown in cultivation until Col. Malcolm N. Ross, a retired army officer living near Arden, North Carolina, began experiments several years ago. He attributes the restriction of *Shortia* to the unusual method of seed reproduction. The seeds not only ripen, but may start to germinate, on the seed-stem, which then decays.

After several seasons of watchfulness, Col. Ross was able to remove germinating seeds on a needle. He planted these on a peat and sand mixture where they lived and grew, although, for some unknown reason very slowly.

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# Garden Thieves

*By* PAULINE DILLINGHAM

Most flagrant thefts, my garden knows,
For pilfering heat and sunshine dare
To steal its perfume from the rose,
And bandit winds, bright petals bear
By force away; marauding bees
The powdered gold of lilies, seize;
Vile worms, the larkspur loot and spoil;
While elms that lean above the wall,
Filch strength and virtue from the soil.

Last comes the frost, worst thief of all,
And robs my garden, in a night,
Of beauty, sweetness and delight.

But Nature has reserves in store
A thousand thieves could not destroy;
And loveliness, next Spring, once more
Will bud and bloom and bring me joy.

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# Hardy Potted Plants

*By* VICTOR H. RIES

POTTED plants are intriguing here and there in the garden, but all too seldom do we realize the amount of care required to keep them in good condition or, even, alive. The solution seems to lie in choosing less demanding plants, and the accompanying photograph is of a strawberry jar filled with such tolerant succulents.

A wide variety of species are adapted to this use. There are several dozen available varieties of the hardy hen-and-chickens. In fact, some gardeners find that they have better success with these potted than in the rock garden. Then there are cousins of these, the echeverias, which are usually larger, more vigorous and more colorful. One or two of these are available at most greenhouses.

We may use, also, the sedums, or stonecrops. Among the hardy species, the trailing ones especially, such as *Sedum album, sarmentosum, acre, sexangulare, spurium, sieboldii,* and *dasyphyllum,* may be used. Or we may use some one of the many tender forms handled by the florists for dish gardens. Since these are usually sold without species names, it will not be worth while to suggest them.

The pottery strawberry jar is filled with any good garden soil and watered at each opening as well as at the top. It should be placed in a sunny spot for best results.

# Taming the Mushroom

*Improved methods create a large industry no longer a business gamble*

*By* AUSTIN C. LESCARBOURA

ENLISTING the aid of Nature and the laboratory, the gamble that once was the mushroom business has given way to a conservative enterprise with a scientific basis. Indeed, it is now an industry of vast proportions, supplying the delicious fungus virtually throughout the year and at prices within reach of the average family.

The common mushroom, *Agaricus campestris,* grows in short grass in all the temperate regions of the world. Although many edible mushrooms may be mistaken for worthless or poisonous species, the common mushroom, if freshly gathered and sound, may be readily identified from all poisonous species and eaten with safety. It is of small size, seldom reaching five inches in diameter. The under side of the cap has a frill. The gills are free from the stem. The stalk is solid or slightly pithy.

It is this mushroom that forms the basis of the modern mushroom industry. Choice specimens are picked in the fields to propagate themselves under the most favorable conditions of scientific culture. And thus a single plant frequently provides for millions of cultivated mushrooms through the spawn-maker and the grower out to outdo Nature itself.

The majority of mushroom producers are located in Chester County, Pa., close to Philadelphia, yet there are growers scattered throughout the country. Caves, abandoned mines, discarded ice houses and breweries, once held at a premium for mushroom culture, have given way to special mushroom houses wherein temperature and cleanliness are under most careful control at all times.

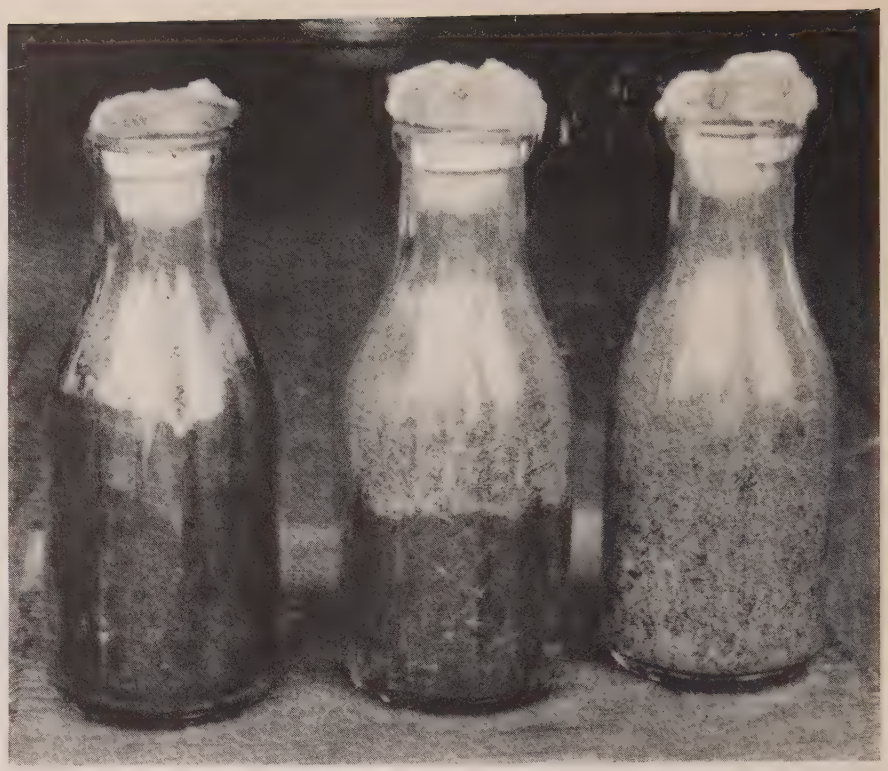
The present highly-organized business does not, of course, yield the large profits of the past. Mushroom houses are expensive and the planting area is limited. But, in place of the large losses and equally large but rare gains of the past, growers are now working with greater certainty for a reasonable profit.

Mushroom culture today owes a great deal to the skill of the spawn-makers, for on the quality of the spawn depends the success or failure of a contemplated crop. Years ago, cakes or bricks of compressed manure that had been placed in contact with mushroom-bearing soil were used. The tiny silken threads or mycelia of the mushroom spawn were relatively scarce in the dry mass of uncertain age. Planting was little more than a gamble. Further, the exposed spawn bricks were almost certain to pick up undesirable molds or pollen from the air.

MUSHROOM SPAWN READY FOR SHIPMENT

The glass bottles in which the material has been incubated have been broken away and the spawn-filled cores will be wrapped and shipped not only to American growers but throughout the world

Today's spawn is different. Spawn-makers have sought the aid of bacteriologists, chemists and others in evolving a scientifically correct method. The basis for the bulk of the spawn produced is still horse manure, although such grains as oats, wheat or rye are sometimes employed. The mass is thoroughly washed and the water is removed by centrifugal dryers. It is chopped up fine and stuffed into special glass bottles. A hole is drilled down through the center of the mass for subsequent inoculation. The bottles, provided with sterilized cotton plugs, are



STAGES OF INCUBATION

The bottle at the left has just been inoculated with spawn, the center bottle for ten days and the other bottle for three weeks. The spreading mycelium has changed the color

sterilized in a steam chamber at a temperature of 250 degrees for about three hours. The medium for the spawn is by now thoroughly free from any living mold, pollen or other form of life. It is simply so much sterilized material containing certain desirable chemicals for encouraging mushroom culture.

Meanwhile, the spawn-maker has been gathering his spores. Perfect mushroom specimens are sought, either in the wild state or among the beds of growers, and picked for spawn-making. These specimens, with their veils or underskin still intact to insure the complete absence of contamination, are thoroughly scrubbed and carefully cut, thus exposing the gills or fringes. Sections are placed in sterilized glass tubes, permitting the deposit of the spores. Within a few days the inside walls of the sealed tubes are coated with a brownish stain—billions of tiny cells or spores. A single mushroom can deliver as many as ten billion spores, each capable of producing countless mushrooms in its own right.

The transfer of spores to the sterilized medium bottles must be handled by a skilled bacteriologist, working under carefully controlled conditions. In the leading spawn-making establishments the laboratory rooms are thoroughly washed and disinfected just prior to such operations. Even the air entering the room is washed and filtered to exclude mold and pollen. The bacteriologists wear surgeons' gowns, and, frequently, tight-fitting head coverings and masks. A bunsen burner serves to sterilize the instruments, bottle necks, cotton plugs, and other accessories. No chances are taken.

Once inoculated with the spores, the medium bottle is sealed with its cotton plug and sent to the incubating room. Here, favored by a carefully-controlled temperature of 72 degrees, the spores soon send out their mycelia through the manure mass. The original dark brown or black contents change rapidly to light brown, or even white, as the mycelia grow in density.

From the spores of a single mushroom some thirty billion bottles of spawn might be made up. It is simply a matter of making transfers from each of the first spawn bottles to a second batch of bottles, and from each

TRANSFERRING THE SPAWN

Working in the laboratory with everything carefully sterilized to keep out pollens and molds, the spawn, multiplied in test tubes, is put into bottles filled with washed manure to be incubated

THESE ARE MUSHROOM HARVESTERS NOT MINERS ON AN INSPECTION TOUR

The men work in the darkness of the closed mushroom houses that have replaced the hit-or-miss caves and abandoned ice-houses of the past. The bed will bear for several months, then taper off

of the second bottles to a third batch, and so on and on. But the chances of ultimate contamination would be too great. So the spawn-maker makes several dozen bottles from the spores, several dozen transfers from each of the initial spawn bottles, and the large number of commercial spawn bottles on the third transfer. In other words, the third transfer, running up into the thousands of bottles, is only three steps removed from the original parent mushroom.

When the mycelial mass has reached sufficient proportions, the spawn is ready for use. But since supply and demand are not perfectly geared, in this as in other food industries, the bottles are placed in cold storage where, at a temperature of 33 to 35 degrees, the mycelial growth is stopped. The spawn is now dormant and remains fresh almost indefinitely in cold storage.

To facilitate shipment and keep down transportation charges, the spawn bottles are smashed to free the inside core. The core is wrapped in paper and placed in a partitioned cardboard box for shipment. American spawn is so superior that it is now being shipped not only to Europe and South America, but also to South Africa, China, Australia and other countries.

From mushroom spawn to mushroom bed is the concern of the grower. Here, again, manure is the main stock in trade, and, incidentally, a growing problem among mushroom growers. In fact, for years past, due to the increasing scarcity of horse manure, many attempts have been made to evolve a substitute. Sawdust, fibrous materials and other bodies impregnated with various chemicals have been tried. But the natural product still reigns supreme in favorable price and in final results.

The mushroom bed is a layer, several inches thick, of thoroughly rotted manure, on which lumps of spawn are placed at frequent intervals. When the mycelia have spread from the lumps of spawn to the adjoining manure mass, the bed is covered—"cased"—with an inch or so of rich black loam. The bed is now sprinkled frequently with water. The mushroom beds are kept dark, although fresh air may be admitted at night. With a favorable growing temperature of about 50 degrees, the mushroom crop arrives in five to six weeks' time.

The crop runs for several months, finally tapering off until it no longer pays to tie up the space for the few straggling mushrooms that are picked each day. So the grower discards the spent mushroom soil, selling it to nearby farmers, or to golf courses, as fertilizer for lawns or greens.

The wooden shelves on which the beds are placed are taken down, thoroughly scrubbed with wire brushes, washed with disinfectant, and placed outside to dry in the fresh air. The mushroom-house interior is thoroughly sterilized, preferably with live steam. The boards are replaced and the rooms made ready for another planting.

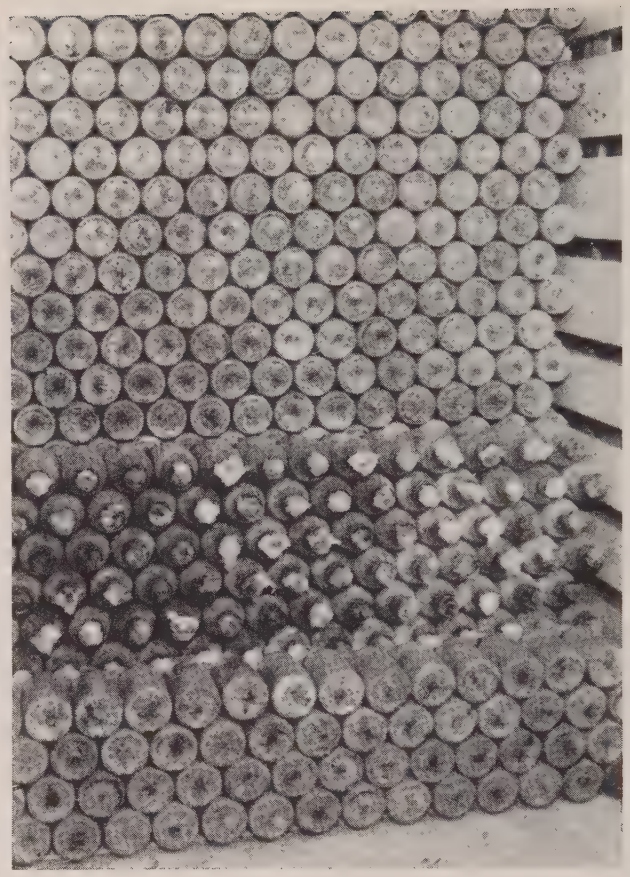
Temperature is the main problem of the grower. If the thermometer drops below 40 degrees, the mycelia become dormant and no mushrooms are produced. If the thermometer soars above 70 degrees, the mushrooms rush to maturity, decay so rapidly that they cannot be picked quickly enough, and a heavy loss results.

However, due to the tremendous cost of cooling any sizeable mushroom-house, the growers generally do not attempt a crop during the warm summer months. It being easier to heat than to cool, crops are generally limited to the cool or cold months of the year, with the temperature regulated so as to accelerate or retard the harvest in keeping with rising or falling markets. Some growers, with cooling facilities, do raise mushrooms in the sum-

mer and score top prices.

Packed in three-pound grape baskets, mushrooms are shipped to markets many hundreds of miles away. Current supply and demand sets the prices paid, and these fluctuate widely. But even at the lowest prices, when the market is veritably glutted with mushrooms, the growers still make out. Most successful are those growers who, through rare skill and good equipment, harvest as much as two to three pounds of mushrooms to the square foot of bed, in sharp contrast to a pound or less in the old days.

Thus the mushroom business has become a safe and sound industry, with as conservative a group of agriculturists as one could find in any field. Mushroom culture is no longer a glorified gamble on the win-all lose-all principle. Those many beautiful stone residences one sees in the vicinity of Kennett Square, just outside Philadelphia, have been built out of mushroom profits and are the homes of growers who are here to stay. Meanwhile, the former rare delicacy has become a common article of food. Mass production and low prices spell a sure market and steady, moderate profits for the established mushroom-grower.



IN COLD STORAGE AWAITING DEMAND

Thousands of spawn bottles are thus held until market conditions warrant shipment, the spawn remaining dormant at a carefully controlled temperature

# Sea Grapes

*By* HUGO H. SCHRODER

ALONG the coasts of southern Florida are many specimens of a distinctive, round-leaved shrub or tree, variously known as sea grape, shore grape or raccoon grape. This plant, though usually occurring as a shrub, may grow to tree size—up to forty feet in height. It is a native of lower Florida and the West Indies, and is one of the state's most truly tropical trees.

The large, rounded leaves are thick in texture. Ordinarily a deep glossy green, the foliage of the sea grape may assume various colorings, somewhat like the hues of more northern trees in autumn. The new leaves also present a colorful display to add to the attractiveness of this seaside growth.

In spring the tiny whitish blossoms appear on racemes, four or more inches in length. They are not the least bit showy. Later in the year the plant will be well covered with grape-like clusters of fruit. These are frequently used for making jelly and, Dr. H. Nehrling states, sometimes for making wine. The name raccoon grape evidently means that these animals are partial to the fruit.

The sea grape, *Coccolobis uvifera*, is one of the conspicuous sea-shore growths on the south-Florida coasts. It is frequently utilized for planting in gardens near the coast and makes an effective tree wherever it has room to grow. Sometimes the wood has been used for cabinet work. When boiled, sea grape lumber gives a red color.

The snowy egret returns to her nest after having been frightened away by the photographer. The right-hand egg in the nest has been broken by a boat-tailed grackle in the brief time it took the photographer to get his equipment, only a few rods away.

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# GRACKLES AS MARAUDERS

By HARRY PEDERSON

Green Island is low and flat, about a mile and a half around, three miles from shore and thirty miles from the south end of the Laguna Madre on the southeast Texas coast. Green Island is green, covered thickly with catclaws, Spanish daggers and prickly pears. In the nesting season it is the home of the largest colony of reddish egrets in the United States. Besides American and snowy egrets, Ward, Louisiana and black-crowned night herons increase the bird population to a total of 20,000.

Mexican fishermen, who in years gone by sailed about that part of the Laguna Madre, made the rounds of what nests they could get to for eggs. Coyotes managed to reach the island and the egrets and the herons learned not to build on the ground. During the years of the lust for feathers, the plume hunters came, but somehow the colonies survived. Fifteen years ago the National Association of Audubon Societies took the island under its protection to assist the birds in their fight for life.

After throwing out the broken egg, the mother egret sat on the remaining ones and laid another before she was again frightened from the nest.

I visited the sanctuary in May, 1937, and remained for a week with Warden Larson. From the top of the watch tower that stands a few feet from his house I looked out over the nesting grounds. I walked along the crooked lanes cut through the heavy growth. And yet, although this was the height of the nesting period, there seemed not as many birds as there should have been.

Then I began to notice the big blue-black, impudent, boat-tailed grackles. Grackles are about as welcome in a bird sanctuary at nesting time as opossums in a hen-house.

I investigated. I left a reddish egret's nest with two blue eggs on its shallow bottom and returned in ten minutes. There was a wet patch where the eggs had been, and a piece of dripping egg shell. That was why the nests along the paths were empty and falling apart.

"What about the grackles?" I asked John Larson at the house that evening.

"Let's not talk about the grackles," he said.

"Out of cartridges?" He shook his head.

"Orders, that's all," he said, "I've been ordered not to shoot the grackles."

Then he told me that some bird lovers claimed there was no need to shoot grackles before there were sanctuaries. So why shoot them now? The protests became so loud that he was ordered to put away the gun. He

When the mother bird again was urged away from the nest to allow the photographer an opportunity to catch the boat-tails at their destructive work, the nest looked like this.

The grackle finally arrived on the edge of the nest, looked over its shoulder at the photographer's blind and calmly went about its business of making a meal from the contents of the eggs.

told me how it was to take visitors along the pathways with grackles following after to swoop down upon the momentarily abandoned nests; to know that egrets had laid as many as three or four clutches of eggs, only to be forced finally to abandon their nests and go away; how out of seventy nests he had had under observation only two had come safely through the period of incubation. John Larson knew that unless the Audubon Society was allowed to change its policy Green Island would be as bare of nesting egrets and herons as any other Texas island.

As I went about my task of taking pictures I became more and more conscious of the grackles. They followed me wherever I moved. I knew that, like the visiting bird-lovers, I was causing the death of unborn birds, but I was determined to photograph grackles stealing eggs.

One morning I came upon the nest of a snowy egret low in a cat-claw bush. It contained three blue eggs. My camera equipment was a few rods away. I hurried for it as quickly as I was able. When I returned three grackles were on the edge of the nest. They flew before I was within camera range. One egg was gone, another one was punctured. In an hour the egret came cautiously back to the nest. She examined the eggs, speared the punctured one, and dropped it over the edge of the nest. That left but one egg. She sat on this like a sleek

Here we have graphic evidence of what an egret nest looks like after the grackle has finished with it. In many cases egrets have laid as many as four clutches of eggs without raising a family because of the activities of the wary and destructive boat-tails.

Two young egrets seem intent on something of interest in the distance, posing in a ghost-like silhouette for the photographer. These had escaped the grackles.

white hen. I finally startled her from the nest, which was necessary to get the evidence I desired, but during the time she had been on the nest she had laid another egg.

It took another day of waiting before a grackle, still wary, came. He appeared suddenly, looked saucily back at my blind, then punctured an egg and calmly drank its contents. I was happy to get that raider's image on the film, for the pictures might aid in his undoing.

I left Green Island the next day, a little sick at heart over what I had seen there. There was little that could be done about the grackles in 1937; that damage was too late for mending. But another nesting season is on its way. Have the egrets survived the raids of the fishermen and the coyotes and the plume hunters only to disappear because of the ignorance of their friends? I wonder if the power of the unknowing bird-lovers, those people who believe that eliminating any feathered thing is a sin, will be so great that it will force the Audubon Society to continue as it has been for the past two years and allow grackles the run of the island. If that is the case, it is inevitable that the flocks of egrets and herons on Green Island will soon suffer a diminution in population as serious as though they had been visited by a plague.

# THE ROBBER FLY

*Photographically Recorded by Lee Passmore*

Belonging to the family Asilidae are more than three thousand species of robber flies, all of which have been named and recorded. About five hundred of these occur in the United States, the handsome profile of one of which appears above. They range in size from tiny midge-like creatures to those having a wingspread of more than two inches. As the name of the order, Diptera, indicates, these flies have but two wings. Their flight is rapid as they dart about from place to place, but they do not remain long in the air, coming to rest on a twig or upon the ground at frequent intervals. When on the ground, their color harmonizes perfectly with their surroundings, and as they usually remain motionless at that time, it is difficult to locate them. One may go quite close to them before they become alarmed and take flight. They prey upon other insects, nearly all of which are captured on the wing. The mouth-parts, formed like a beak, are used to suck the juices of their victims. All of the photographs in this series are greatly enlarged. Since the individuals shown in these photographs were not captured, the species was not definitely identified. The thorax of the robber fly is extremely large when compared with the slender abdomen. The muscles that control the wings are equally powerful, enabling the insect to carry its victim through the air with ease. The strong legs are possessed of many long spines, which aid in holding its victim more firmly while the robber fly is in flight. At the tip of the proboscis are a number of stiff bristles that hold this organ in position against the body of its prey when it is being killed.

Many of the species have the head and front legs covered profusely with long white or gray hairs. The long, sharp proboscis or beak surrounded by them gives the insect a frightful appearance. Such an impression as this must strike its intended victim with terror. A huge-maned lion would appear less formidable than

one of these be-whiskered flies, if the insect were as large as the lion. Two large compound eyes, each having more than two thousand facets, give the robber fly the most perfect vision.

Many miniature dramas, like the one portrayed here, are enacted by robber flies. The author was fortunate in securing this photograph, showing a large robber fly a moment after it had captured a blue-bottle fly in mid-air after a pursuit of only a few yards. The insect alighted upon a stone nearby where it feasted upon its prey. Twenty minutes later, with abdomen greatly distended by the juices extracted from its victim, the predaceous creature flew away, perhaps to search for another meal.

While the exposure was being made, the camera was placed within a few inches of the creature, but it was apparently so occupied enjoying its feast that it did not notice the presence of the cameraman.

The wings of the robber fly are quite transparent, the nervures showing perfectly when photographed against the light. These insects have no sting, and as they do not feed on warm-blooded animals, they are entirely harmless to humans. When not in search of prey, they rest for long periods, usually in the shade of a bush if the day is warm. When very hungry, they will attack other creatures much larger than themselves. Frequently the victim is too heavy to carry and must be eaten on the spot.

# A Rufous Hummer Family

*As photographed by Norman Edson*

Two pearly white eggs lie snugly in a snow-white blanket of dandelion fluff, in a garden near Burton, Washington. The outside of this nest was built of dried grass and madrona leaves, bound together by shreds of cobweb. Around the edge, a line of bright green moss was inlaid for decorative purposes. The nest was balanced on the limb of a shrubby madrona tree, three feet from the ground. A broad leaf shed the rain and afforded shade.

In another nest, built in a Van Fleet rose beside a bedroom window, two tiny hummers first saw the light. When this picture was taken something had happened to baby sister, but the little mother is devoting herself to the surviving child. Here she is endeavoring to shade him from the sun. Although he hadn't hummed when the last photograph was made he was fully grown and ready to dart from the nest in his first flight, fifty yards or more, to some safe perch. After a few days of trial flights he will join the gang around my delphinium bed.

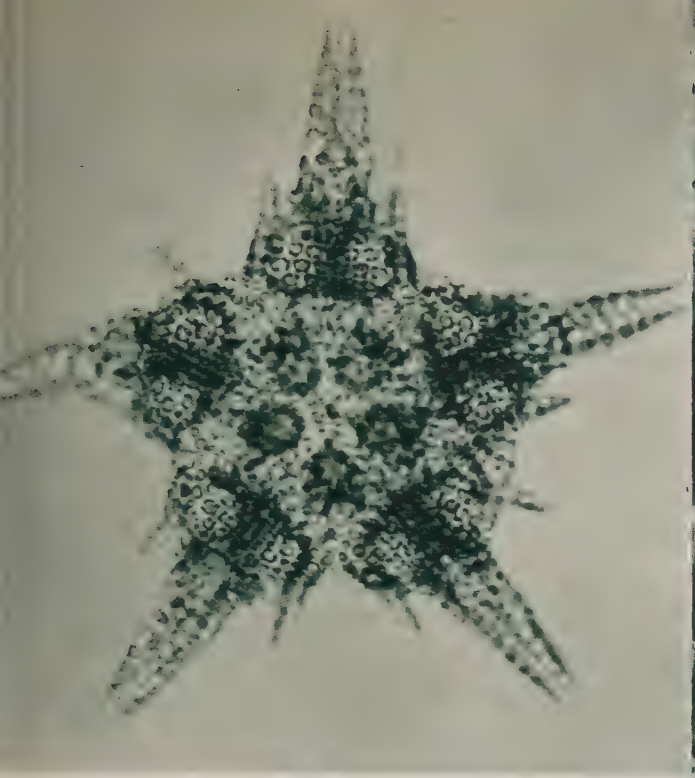
# CHILDHOOD OF A SEA-STAR

*Photographs from Black Star*

If one sweeps the surface of the summer sea with a fine plankton net he will get a quantity of minute animals, toys of the sea, that populate its waves in great numbers. This is the plankton. Among these plankton animals each sea-star spends its youth.

True, the serpent-star here illustrated came from an egg laid at the bottom of the sea. But as soon as it emerged from the egg, a minute oval larva, it felt a desire to move upwards. Thus it came to its food, and passed successively through several fantastic forms, transparent and as delicate as glass.

By the time it is a millimeter in length it has developed symmetrical appendages

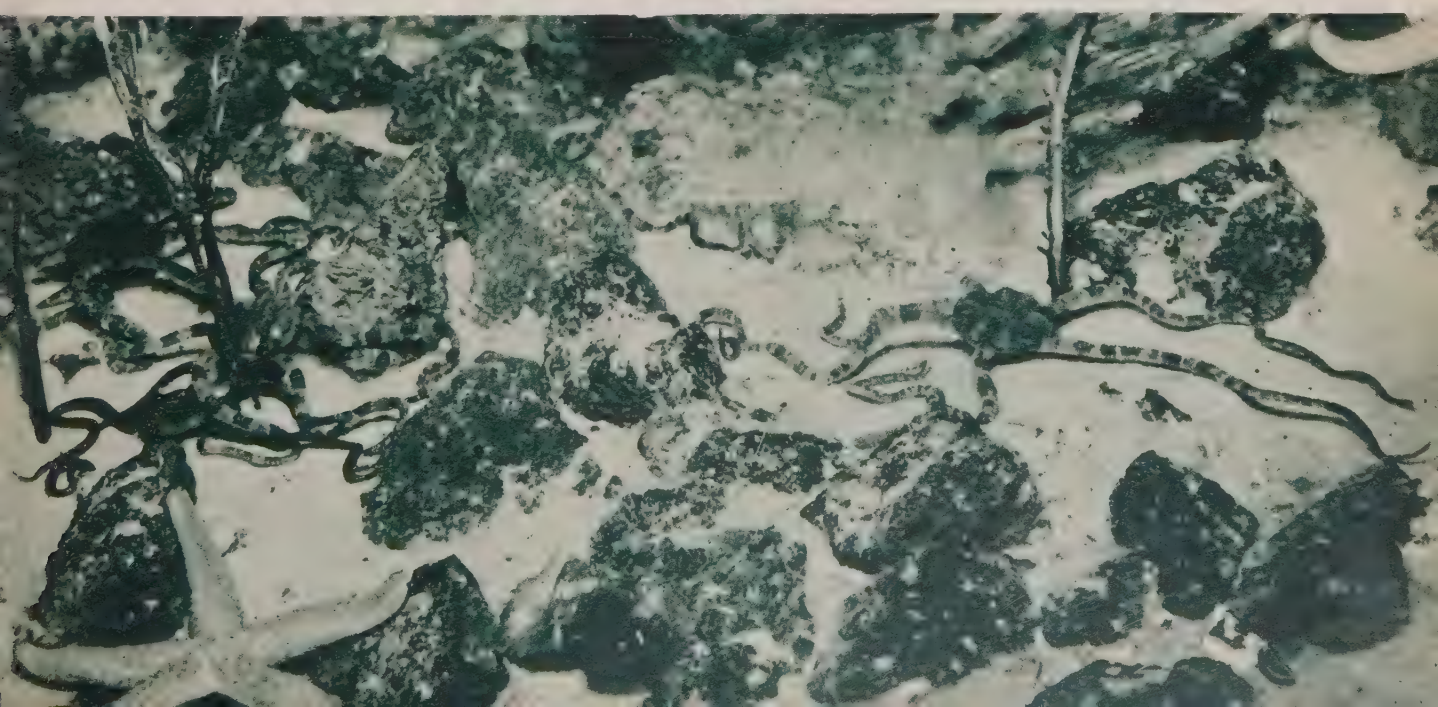


that allow it to float in its liquid home and storehouse. These arms are covered with fine hairs, ever-waving, which help it to move, although slowly and weakly. Finally it develops mouth and intestinal tract, to digest its microscopic food. These successive stages, the last picture showing the beginning of its ultimate five-pointed form, are shown on the first page.

These transformations have taken quite a while. Gradually the unsymmetrical five-pointed form shown in the last picture on the previous page is developed. The delicate waving arms are absorbed in this process, and with its growth comes added weight. This causes the larva to sink and, discarding the now useless exuviae of its larval form with its appendages, it descends to the bottom of the sea where it was born.

Now the little serpent-star has taken the form shown above. Beside it is shown the underside of the adult serpent-star, including its mouth and the bases of the five arms that surround it. The numerous suckers that cover the lower surface of these arms are its means of propulsion, and the hands that obtain its food.

Below is a section of the sea bottom off the coast of Holland, with a common sea-star at the left, and numerous serpent-stars disposed over the sandy surface of the ocean floor. Such a scene is duplicated in many places along the coasts of the Northern Hemisphere.



# CASSIN'S VIREO AT HOME

*By* ELIZABETH KAYE BUCHECKER

*Photographs by Walter Bruce*

This curious hanging nest was found in Indian Canyon, near Spokane, Washington, four feet up in a lone dead pine tree beside an old wood road. It was a bulky affair of grasses and vegetable fibers, plastered over with lichens and pieces of wasps' nests, and loosely bound to two twigs with plant fiber. The builder was a Cassin's vireo—the western form of our eastern solitary or blue-headed vireo—differentiated from its relatives by the conspicious white markings about the eyes. Its song suggests that of the red-eyed vireo but is less insistent and more musical.

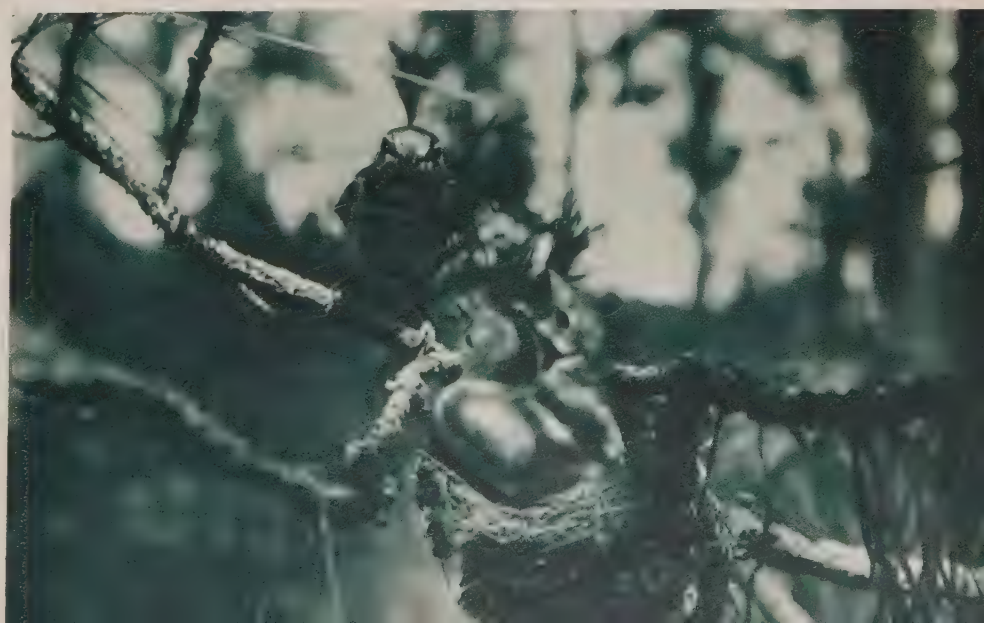
On June 18, when the nest was discovered, the four young birds were almost devoid of feathers, and their eyes were not yet open. There was nothing undeveloped

about their appetites, however. Disregarding the camera-men, the parent birds, after showing some hesitation over the black boxes set up so close to their precious family, supplied insects or green and white caterpillars about every twenty minutes during the morning's observation. On one occasion, both birds came together. The male had an enormous grub that he tried to push down the throat of one of the little birds. This being found to be physically impossible, the old birds pulled the grub apart, and fed the delicacy piece-meal to the fledglings.

On June 24 the birds were completely feathered and were jostling

each other in their crowded quarters. Their growth in five days was almost unbelievable. They seemed about ready to leave the nest, which was well, for they were entirely out in the open, without a leaf to shelter them from the elements, and the rain was beginning to fall. The parent birds moved nervously about while the cameras were being set up, but after a short time paid no attention beyond uttering an alarm note much like that of an anxious wren. The liveliest of the brood resented the presence of outsiders, however, and took wing. He was captured with some difficulty and put back into the nest, in which he refused to stay, and his enforced pose for his picture, the second on this page, evidently did not thrill him. Finally, with a lurch and a flutter, he disappeared in the shrubbery.

Attention was now turned to the nest, by now sagging perilously from the weight and activity of the young birds. A piece of stout cord woven in and out by the bird man anchored it firmly in place. The mother vireo displayed lively interest in the proceedings, uttering harsh notes of inquiry as she flitted back and forth among the branches of the home tree. She might well have been commenting on the intruders who divided her family and made feeding more difficult.



This proved to be the last picture taken of the vireo family, for two days later the nest was empty. The birds had joined forces with the host that protect the orchards and gardens of the fertile and prosperous Spokane valley,

# Great Flowered Magnolia

Few trees in all the world excel in beauty of form, foliage and flowers the great-flowered magnolia of our southeastern states, the *Magnolia grandiflora* of the botanists. Normally pyramidal in shape, it sometimes attains a height of ninety feet. Its lustrous leaves, glossy green above and rusty beneath, remain two years in the tree, making it one of our most perfect evergreens. Its native habitat is a rather narrow strip along the coast of the Atlantic and the Gulf of Mexico from Texas to North Carolina. In cultivation it does well in moist situations northward for two or three hundred miles. Its large fragrant creamy white flowers appear from April to June, according to latitude. These photographs were taken by A. R. Cahn of Norris, Tennessee.

# Desert Sentinel

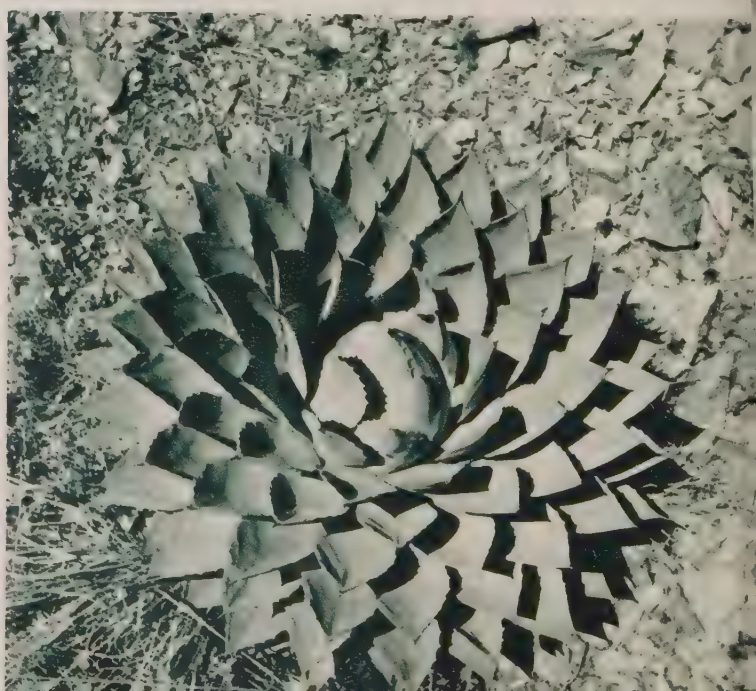
By Harry L. and Ruth Crockett

A member of the group that has climbed the mountains to the Transition Zone is *Agave parryi*. Here it spends years in growing into a circular cluster of basal leaves that are spiny, pointed and approximately a foot long. When the year arrives for the plant to bloom, it sends up a great stalk from the central circle. This stalk rises until it is eight or ten feet high and from the top emerge twenty or thirty beautiful pads of orange-yellow flowers. The lower group of pads form seeds while the upper groups still are budding. The energy stored over the years is spent in one glorious profusion of golden flowers that open during an entire month at successive levels on the tall stalk.

This pinnacle of succulent flowers soon becomes the center of local bird and insect life. Gnats, flies, hornets and bees gather in great numbers about the blossoms for their share of the food, and butterflies, including the great tiger swallow-tail, are much in evidence. The abundant insect life attracts birds of many kinds. The Virginia warbler, usually content to hunt in the low bushes, ascends to the top, and the western tanager, whose color scheme of red head and yellow closely harmonizes with the blossoms, is usually present. The broad-tailed hum-

mingbird seems to think the plant is his own private lunch counter and puts on a noisy show of power when other birds approach. It is rather ridiculous to see one of these little sprites attempt to drive away five band-tailed pigeons, as we did one morning, and exciting when a rufous hummingbird, as pictured on the preceding page, tries to usurp his territory. Pictured at the left is a black-headed grosbeak that has come to the plant for food.

The scene is often ornamented by the majestic soaring of the red-tailed hawk as he wheels in great spirals in search of rodents, or by the quick dart of a Cooper's hawk from some protective foliage nearby. As the flowers at the top open and are fertilized, the fruits are forming at the bottom. The pods contain three or rarely four stacks of disk-like seeds. When these have matured, the entire plant dries up, and the tall pole of empty seed pods remains standing for a year or more as a stark monument to a glorious beauty that has passed. No birds or insects visit the plant now, for even the seeds have been scattered by wind and rain. The elements finally topple this last remnant of the plant and the fibers decay, but the seeds have been scattered on the hillside in a hundred places and some day will perpetuate the glory of the parent plant. Pictured below is the beautifully grouped rosette of spiny leaves from which the stalk springs, and the fruits that mature on the lower branches while the upper parts of the stalk are still blooming.



# MARSH AND SWAMP BIRDS

*Photographed by Wray H. Nicholson, Orlando, Florida*

The clapper rails, named from the bird's voice, inhabit the marshes of most of our coast line. The form here shown is Wayne's clapper rail, the race that inhabits the tidal marshes from the Carolinas to northern Florida. It is one of our larger species, about the size of a bobwhite, but slender and narrow in body, the better to thread the dense marsh vegetation. Like all our rails, it is classed as a game bird.

The Florida redwinged blackbird is one of the numerous races of this wide-ranging marsh nester. This intimate portrait of the brooding female shows how widely the sexes differ in plumage. The male is glossy black with no variation save the gaudy epaulettes that adorn his shoulders, patches of brilliant red with borders of yellow. Such a uniform would be conspicuous on the nest, but the male leaves the task of incubation to his mate.

The dainty least bittern, no larger than a meadowlark, is the smallest of the heron tribe. In its form it is an exact replica of the larger herons. The pleasing shades of yellowish brown that cover most of the body, set off by the glossy black and chestnut of the upper parts, make it the most beautiful of the group. Although classed as a bittern it seems more like a typical heron, and it is interesting to note that its eggs more nearly resemble those of the herons than the bitterns, being a pale greenish-white.

The little black rail, about the size of a sparrow, and our smallest species, nests in suitable places, usually freshwater marshes, over most of the United States. Its small size and secretive habits make it difficult of detection, and it is probably more common than is suspected. It is called our smallest game bird, but the fact that we class as game so diminutive a bird is not to our credit. Its general color is dark slate, with chestnut brown on the hind neck and upper back, and fine bands and speckles of white.

It is not often that one finds a nest of the prothonotary warbler that affords so open a view as this one, for its typical home site is in the deserted hole of a woodpecker, or some cavity that entirely conceals the nest. Usually the ground beneath is flooded, and there must be trees. It is a bird of our southeastern swamps, ranging north to Maryland and New Jersey, and in the Mississippi Valley to Minnesota and Ohio. It winters in Central America and northern South America.

The black-necked stilt has a rather extensive range in the warmer parts of America; in the United States it nests chiefly in alkaline marshes in the West, but also in Louisiana and Florida. The bird is not only black-necked (above), but it is *all* black above, and *all* white beneath. Stilt it is called because it seems to stand on stilts, a fact that is not apparent when it folds itself up, as it must do when sitting on its eggs, like this one in a Florida marsh.

# ★ Conservation ★

**A part of Nature Magazine each month is devoted to the expression of practical opinions on the vital issues affecting our use and abuse of natural resources, including wildlife, and dedicated to the purpose of assisting Americans to play a militant part in the attainment of constructive conservation aims.**

★

## HIGHWAY ZONING IN CALIFORNIA ★

"Let's see whether we can't find some back roads". This is becoming the slogan of the motoring American who seeks enjoyment and relaxation in automobile driving. It is gradually being borne in upon them that most of the highways of this country are the last place to find beauty and pleasure; that the roadsides of the country have been turned over to the billboard industry and to roadside business, and that the rare instance of roadside good taste comes as a surprise to the traveler.

Licensing, taxation, set-backs and other devices have been tried, with varying success, to bring about this good taste, force respect of the amenities and increase safety of highway travel. California has taken the lead in another attack upon this problem through county highway zoning.

Several years ago The American Nature Association collaborated in a survey of roadside conditions in California. This survey was conducted by Mr. and Mrs. W. L. Lawton of the National Roadside Council. The published report revealed the strangle hold of the billboard industry, and new highs in bad taste in roadside business structures. Since that study California has passed a law directing the establishment of county planning commissions that would draw up master plans for county zoning and development. Thirty-three out of the State's fifty-eight counties—comprising about 85 per cent of the population—having carried out the terms of the law, thirteen counties actively, a survey of results was in order.

Convinced that preservation of the beauty of the rural countryside of the United States is an important phase of conservation, the directors of The American Nature Association allocated educational funds for such a study. Again it was conducted by Mr. and Mrs. Lawton, and the report is presented in Volume One, Number Two, of *The American Nature Association Quarterly Bulletin*. Copies of this *Bulletin* are available to all members of the Association on request to the Association's offices in Washington.

The report of this survey is revealing in several directions. It brings out, in fact and in picture, both the problems and the possibilities of county highway zoning. We find, for example, that San Mateo County can boast of one thousand miles of paved highways and county roads free from billboards and protected from roadside business. This is a remarkable achievement, and indicates what can be done with the right philosophy and the courage to defy the selfish dominance of the billboard industry and the short-sighted ignorance of the majority of individuals seeking commercial privileges along the highways.

Certain roadside business enterprises are necessary to provide fuel and food for car and occupants. The San Mateo County Planning Commission, however, is unable to see why these enterprises should not have buildings that are architecturally consistent and in good taste. The result is that this county is one of the most outstanding in the United States, an example and inspiration to all. Other counties have lacked, in varying degrees, the steadfast purpose of San Mateo County; have been less willing, or able, to combat influences that profit at the expense of the best control of the highway environment.

This influence, as exercised in the right places by the billboard industry in California, has been a constant stumbling block to progress. The so-called "organized industry", controlling the large boards and the choice locations in California, is almost entirely in the hands of one company—Foster and Kleiser. Wealthy and powerful, able to curry favor politically through donation of free billboard space to political candidates and various civic enterprises, this company has been largely successful in fighting restriction and keeping its signs where it wants them. Respect for scenery, safety and the public interest has been no more in evidence in California than elsewhere.

With respect to the billboard industry in California, and its attitude, we quote from the Lawton report:

"In the last session of the California Legislature they

fought tooth and nail to kill the effect of county zoning on highways by amending the state billboard act to provide that, in county zoning, wherever any business is allowed billboards must also be permitted. Under this provision a zoning ordinance might establish several classes of business districts allowing certain businesses in one class but prohibiting them in others. Yet billboards must be given highly preferential treatment and allowed in any and every business zone! This means, for example, that when you permit a properly designed filling station on a highly scenic road, such as the Carmel-San Simeon highway, there you must also permit the disfiguring billboard.

"The fundamental principles underlying the protection of rural highways by zoning are that business shall be kept off these highways so far as possible; commercial zones shall be created only where necessary, shall be small in area and shall be open only to those forms of business actually needed by the traveler. This does not include billboards any more than it includes dance halls, outdoor zoos, junk yards, or a dozen other uses that clutter and disfigure our unzoned roadsides." The amendment proposed by Foster and Kleiser was passed by the Legislature but not signed by the Governor.

Despite this large and determined obstacle, progress has been made in county zoning in California. It will and must be made elsewhere, otherwise safety and pleasure of highway travel are doomed. Setting aside considerations of good taste and esthetics, as important as they are, zoning of rural highways is plain common sense.

## YELLOWSTONE DAM PROJECT

For many years private interests have turned covetous eyes toward the water resources of Yellowstone National Park, hoping to obtain the right to exploit them for power and irrigation purposes. On several occasions these desires have found form in proposed permissive legislation, quietly—almost furtively—introduced in Congress. Thus far such attempts have been defeated by an informed public and by conservationists and friends of the National Parks who have rallied to defend the Yellowstone.

Toward the close of the last session of Congress Senator Pope and Representative White, both of Idaho, fathered identical bills for "construction of a weir on Yellowstone Lake and a tunnel for diversion of water from such Lake to a tributary of Snake River." Quick publicity by conservation groups prevented these bills being slipped quietly through, and they lapsed as the session closed. However, there is little doubt that the effort will be renewed in the new Congress. Therefore, it behooves every friend of the National Parks to be prepared to combat a strong drive to invade the Yellowstone.

The Pope-White proposal sounded innocuous in its terms, even claiming that it would operate to preserve rather than injure the beauty of Yellowstone Lake. The verbiage of the bills was calculated to soften opposition. They were referred to the Senate and House Irrigation and Reclamation committees. There, in fact, they do not belong, since the proposal involves a National Park and the Public Lands committees should consider it. Thus the wedge was well sharpened to open the way for private exploitation of our oldest and best known National Park—a Park that is an immense asset to Idaho, Wyoming, Montana and other nearby states.

Proponents of the Yellowstone dam, (which is what they mean by "weir") will contend that it will make possible the maintenance of the water level of Yellowstone Lake at a constant point and therefore keep it constantly beautiful. They will urge that it will provide water for Idaho farmers and create more taxable land for the State of Idaho. They will contend that the people of Idaho want and need it badly, although the people of Idaho—except for private irrigation interests, promoters and the Utah Power Company—apparently know little about it.

Defenders of the Parks, were they arguing against the proposal on its merits alone, could easily point out that the water can be obtained without touching Yellowstone Park; that they would not get the water they think they would with a dam of the height proposed; that Idaho is not using properly the water it now has, and is not enforcing its irrigation laws to prevent the present sixty per cent wastage. They could point out that this, or any similar plan, cannot be carried out to its final and inevitable conclusions without destroying the biological, recreational and human values of Yellowstone National Park.

But there is a greater, and what should be a final argument against this or any other proposition that would exploit the natural resources of any National Park. These Parks are the property of the people of the United States. They were set aside to be inviolate in achieving such preservation. No proposal, thus far advanced, that would violate this principle—in the Yellowstone or elsewhere—has justified such a dangerous precedent.

It may be that the proponents of the Pope-White attack on the Yellowstone will point to the recent irrigation tunnel authorized in Rocky Mountain National Park. This will be a weak gesture since that tunnel was—unfortunately—anticipated, and the right to construct it reserved in the terms under which that Park was accepted. However, it is reassuring to have the assertion of Senator Adams of Colorado, who, arguing for the Rocky Mountain Park tunnel before the Secretary of the Interior, pointed to this reservation as a contract, not a precedent, and asserted that he would steadfastly oppose any violation of the Yellowstone, or other National Park.

What, then, can we and should we do in anticipation of the drive certain to come in the next Congress? We can see to it that everyone who has visited and appreciates the value of our common property in our National Parks is aroused and informed. We can assure ourselves that the many members of Congress—who seek support at the polls in November—likewise appreciate the importance of preserving the integrity of our National Park system. Friends of the Parks are now numbered in the millions. It is within their power as citizens and voters to prevent the cession of a single acre of National Park to selfish interests. Give them an acre and they'll soon have a whole watershed.

# Nature Study—Why and How?

## *It leads to a broader life says*

GEORGE F. DILLMANN

**Who carries on this work at Manumit School, Pawling, New York, a distinctive school on a 175-acre farm**

PHOTOGRAPH BY CAROLA GREGOR

FIVE-YEAR-OLD JIMMY WOOS A SCULPTURAL MUSE

**At such an age is the time to start developing in the child a realization of the infinite variety of life**

"GEORGE, where did the wasp come from? Why does it sting? Why can't you tame the wasp like the bee? Why can't it swim in water as some other insects do?"

Direct, simple, and logically defiant comes this barrage of questions. With stubborn persistence the child refuses to accept the testimony of his senses. He speculates on the origins of life that even the recent discoveries about the chromosomes and genes of the nucleus have failed to answer. Why shouldn't the wasp swim like some other insects? It's built differently. Yes, but so are other insects. Wasps were made to fly in the air and build homes of paper, mud, or inside hollow twigs. Yes, but why weren't they made to swim? Insufferably persistent, yet beautifully and naïvely inquisitive into the biological relationships of plants and animals about us, children seek the answer to evolution, heredity, environment, balance of species. This is a scientist's approach, with no preconceived notions.

Your child can be helped to realize that wasps are only one of the 5000 different kinds of insects possibly inhabiting his immediate vicinity. If all the species in the same environment survived, there would be a great shortage of food and consequently a rapidly diminishing number. (This is dramatically demonstrated by the grasshopper swarms in our western states.) Then will he be set directly on the road of scientific inquiry that must never be blocked by such an answer as: "Oh, wasps don't like to swim because they can't. Do you think you can fly in the air? Your arms and legs aren't built that way." The first explanation serves to solve a pressing problem, yet leaves room for the growing speculation that children constantly indulge in when not yet stifled by the expediencies of conventional acceptance.

From their fifth year upward, we believe, children should develop a realization of the infinite variety of life. Animals, plants, the sky, the life in waters of ponds and streams and their interdependence with each other, bear important relation to man. Therefore we have placed special emphasis upon Nature Study in the curriculum of all age groups from the fifth to and including junior high school, where it takes the form of a carefully-outlined biology course.

The child's natural curiosity about the "bugs and snakes and toads" is often left in the air by parents. Most schools even fail to perceive that a continuous satisfying of the questions about natural phenomena is a sure way to build in the mind of the child an idea of the balances and checks in the live world. Once this synthesis has been made, an understanding of human problems and our place in the scheme of things follow.

A great many public school systems are including Nature

Study in their classes as a way toward a more complete understanding of this world. Greater emphasis is being placed on getting an adequate and complete picture of the natural world as the groundwork for a better understanding of the human world. Nature study for young children accelerates the formation of a complete groundwork of life forms at an age when mental absorption goes on at a less selective rate. The New York City Board of Education through the School Nature League has, in the last two years, added many Nature rooms to its schools so that even urban children will realize that the world is not a boundary of brick and stone. The trend is towards a more physical approach for the young child to things that will gradually give him an adequate idea of the world in which he lives.

All large cities have their park systems, and smaller communities have fields, woods, ponds and streams on the spot or within short distances. When the young child, especially from five to nine years of age, is led by even a poorly informed adult who attempts to explain such things as trees, insects, and flowers, quantities of questions arise that show the intense curiosity of the child. "What's the name of this flower?" "Why has the hickory nut such a hard shell?" "Why is one flower blue and another red?" "Why is this quartz so white?" "Did Adam and Eve come from monkeys?" "Why don't you find animal bones in every kind of rock?" "Do leaves fall off trees because they are through living?" "Can you eat turtle eggs?" "Does a toad ever sit on a toadstool?" "Can you bounce on rubber trees?"

THERE IS SATISFACTION IN CLIMBING
And along the way the climbers meet many new Nature experiences that stimulate inquiry

Helter-skelter, right and left, to and fro, until the leader fairly aches from mental calisthenics, searching every recess of his brain for an answer. Children should know these answers, and have a right to expect them. Only then can they coordinate the endless variety of the world about them. If all humanity had been able to satisfy its native childhood curiosity, it would have helped a great deal to understand the conflicts and rights and ideas that bewilder us at present in working out a harmonious adjustment of nations.

Three or four times a week the youngest group of six- and seven-year-olds is taken out on Nature walks. They are observers par excellence. If not extremely accurate, and somewhat grandiose in describing things, they, being closer to the ground than their leader, notice all the minutiae. Their problem is mainly to become cognizant of the wealth of variety. How they love to see things. One of the most successful trips I took with this group was a stone-turning walk. Take a youngster out and help him turn over stones and rocks and watch his reaction and happiness as he discovers something new. Ants, large and small, black, red, and brown, ant pupae, ant callows, pill bugs, millipedes, centipedes, mouse runways, mole runways, ground beetles, carrion beetles, wild cherry pits stored by some mouse for winter food, crickets, pupating caterpillars, spiders, spiders' egg cases, and earthworms.

This is a graphic way to show the variety of life living in darkness. Again, a knowledge of edible mushrooms, collected and fried in the woods with the children toasting their own slice of bread, has set a lot of them hunting the plants themselves. Then imagine a child's reaction in finding that the ear of a cricket is in his legs. Comstock's *Guide to Nature Study* opens the adult mind to many of these wonders. Take a microscope and show them the musical wings of the cricket, the stinger of a bee, the wing of a grasshopper, the spores of a mushroom, the menagerie swimming in a drop of pond water. A good enough microscope to show these things can be bought for as little as $15 and magnifies up to 300-400 times. I told the children they never could find a leaf of black locust turning red in the fall, and they asked me repeatedly about trees they thought were black locusts with red leaves. Take them out in the fall and let them see the variety of berries and nuts, bittersweet, viburnum, dogwood, buckthorn, sumac, poison ivy, nightshade, wild rose hips, hickory nuts, hazel nuts, festoons of wild grapes. Let them eat certain viburnum berries, suck the lemon-flavored seeds of sumac, and swallow the frost-sweetened juice of the wild grape. Go to a patch of goldenrod and see how many kinds of insects you can find on one flower. Let them find maple longhorns, several types of flies that resemble bees, domesti-

THE LITTLEST ONES ARE KEEN

Splendid observers, they are close to the ground and see all the little things that the adult may easily miss

cated honey bees, spiders, lady bugs, aphids, leaf hoppers, gall fly larvae, and others. In the spring explain the difference to them between a mother and a father mayfly and notice how proud this accomplishment makes them. Show them a few constellations. Let them see a meteor, a planet of Jupiter's brilliance, and the band of haze that marks the Milky Way on the blue black dome above. Put some vinegar and baking soda in a bottle, cork it up, and show them that a gas needs room to move just as we do, that it is something else besides emptiness. Putnam's Nature Handbooks, each a popular treatise on special subjects like stars, insects, flowers, or mushrooms, are excellent and non-technical works that answer many questions and show the enormous variety of subjects in parks and in the open country.

Nature Study suffers terrible abuse in many summer camps where it is merely a filler in the program of choices available to the camper. It deserves a definite place in the elementary curriculum in that it helps towards a balanced conception of the universe in which human beings and machines are but a drop in the bucket.

Even if the particular school board refuses to sense this growing awareness of the necessity for an early development of biological principles, any sufficiently eager person can take a group of such children on walks. Take along a few sandwiches and some marshmallows. When mealtime comes let them gather some wood for you. Build a teepee of little twigs the thickness of a matchstick and let one of the group light it. Then let them find a forked stick to hold and toast a sandwich on both sides. Watch the remarks as they eat. Then the marshmallows come. Some will fall into the fire and fizz gloriously, but the frenzied yell is soon appeased with another. Properly handled, a trip of this kind is a revelation. On such a trip I pointed out the raised burrows of some moles that had worked in the ground about the campsite and stuck my finger into the hollow runway. Three of the nine children, after eating, stuck their fingers into the mole runway and tore up fifty measured feet to see how much the mole had traveled and the side trips he had made in search of worms and grubs—a marvelous instance of six-year-old persistence and application. Here is the initiation of young life to its multiplicity of habits. Here is the beginning of inquiry that will later assist in a determination of social habits and a broader understanding that will kill the pernicious evils of pettiness.

At our school the underlying principle in its Nature Study program is to stress the variety of forms in Nature and to correlate them, as the age level increases, with cause and effect, actions and reactions, environment, heredity, and the multiplicity of variations that go to make up every human being with his variety of characteristics.

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# Chocorua Trail

*By* PAUL GRISWOLD HUSTON

Old, shaggy trunks and moss-clad rock,
  The gray stone wall of solitude,
A vireo's nest athwart the path
  On bough's descending amplitude.

The forest, serried trunks in line,
  Usurps the space of former field,
And squirrels leap and scamper bold
  As oak and pine their harvest yield.

A white-throat's plaint, the silver strain
  Of woodthrush, strident call of jay,
The ribboned birch and hemlock green,
  The huntsman's cup by marshes gay.

Again the rambling wall climbs on
  O'er slopes abandoned to the foe,
To mark the land our fathers ploughed,
  This range deserted long ago.

Piled hard and strong to last for aye,
  Rocks drawn by oxen, crowbar, chain,
A cleared ground left for cattle sleek,
  And springs fed fresh by cloud and rain.

The lichened wall its legend tells
  Of man's heroic, losing fight,
While, far above, the craggy peak
  Stands out, our goal, in glorious light.

# Things to Think About

Set aside as a wildflower and bird sanctuary, the four-hundred-acre Conway Robinson Memorial Forest has been presented to the Virginia Conservation Commission by Miss Agnes Robinson in memory of her father, a distinguished Virginia attorney. There will be no road development in the area, although Nature trails are contemplated, and part of the tract will serve as a demonstration forest.

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Containing more than 8000 references, a selected bibliography on management of western ranges, livestock and wildlife has been issued by the United States Forest Service. It is Miscellaneous Publication 281 and is available from the Superintendent of Documents, Washington, D. C., for 45 cents.

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A closed season on the hunting and trapping of martens in Alaska has been ordered by the Secretary of Agriculture, and in southeastern Alaska a closed season has been declared on all fur animals. Facing extinction, the marten should have at least five years of absolute protection throughout the United States, according to Ira N. Gabrielson, Chief of the Biological Survey. Such regulation is, however, a State rather than Federal matter, and most States have not yet awakened to the serious situation.

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S. B. Locke, for the past six years conservation director of the Izaak Walton League of America, has been appointed regional director of the Biological Survey's wildlife work for the northeastern region.

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Lying along important flyways, six new areas in five States have been added to the Federal system of migratory bird refuges. These total 86,000 acres. These areas are the Lacassine Migratory Waterfowl Refuge in Louisiana; Arkansas Migratory Waterfowl Refuge in Texas; Huron Migratory Bird Refuge in Michigan; Black Coulee and Hewitt Lake Migratory Waterfowl Refuges in Montana; Pea Island Migratory Waterfowl Refuge in North Carolina. An addition of 10,544 acres has also been made to the Lower Souris Migratory Waterfowl Refuge in North Dakota.

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Reports of game wardens to the Indiana Department of Conservation add further evidence to data on the destruction of wildlife by automobile traffic. A partial and apparently not systematic report brought out, for example, that 1485 cottontail rabbits were found killed in one month. This is only a small proportion of those killed by automobiles throughout the State. Opossums, squirrels, skunks, pheasants, raccoons, and one mink, fox, woodchuck and partridge were found dead in the same regions for the same period. The greatest loss, of course, comes at night and motorists seeing a wild animal on the road are urged to dim their lights and check the speed of the car. In issuing the statement on these conditions the Department of Conservation unfortunately permits the loose and silly statement that "traffic moving over Indiana roads is a more serious threat to rabbits and other wildlife than the hunters' guns." We'd like to see some comparative figures to prove that statement before we give it credence.

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Warning to sportsmen against introducing western cottontail rabbits into Wisconsin has been issued by H. W. MacKenzie, State Conservation Director. Pointing out that the native cottontail is going through its usual cycle and is at present at a low point in numbers, the director declared that the population will increase naturally. However, he emphasized, its safety is endangered through the introduction of non-native species that may bring rabbit diseases with them.

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Extensive planting of bittersweet in fence corners and other uncultivated areas as a means to providing additional food and shelter for wildlife is urged by the Indiana Department of Conservation. Eagerly sought and much too indiscriminately gathered in the fall for decoration, this plant is fast disappearing. This condition is not confined to Indiana, and other states may well take notice.

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**We have noted with interest, and some wonder, that in wilderness areas in our National Forests, in the National Parks, and on other reservations where Nature's balance is otherwise left undisturbed, fishing is not only permitted but stimulated. Artificial restocking—which is certainly not natural—is carried on, often with non-native species. Judging by the comment that follows, asking the question—"Is Fishing Supreme?"—others have felt some inconsistency to exist in this seemingly accepted policy. We print this contribution in the hope that it will stimulate discussion of interesting and illuminating character. The Editors.**

## IS FISHING SUPREME?

Providing for fishing on otherwise reserved areas nowadays seems an automatic process. This practice, which should excite wonderment, if not stimulate challenge, is so unvarying that it appears to be accepted almost as if in response to an unwritten law. What justification there is for it is not apparent, for fishermen have been just as heedlessly destruc-

tive as have other exploiters of wildlife. It is true that artificial propagation can make up in part for the destruction of certain fishes, but that remedy does not apply to all species nor has it prevented local extirpation of desirable fishes in all parts of the country.

Just why fishing should be permitted on an area that is set aside as a wildlife refuge is hard to understand. Regrettable as it is to admit, there are some, however, who think that refuges should be public shooting grounds, but this tendency must be resisted by conservationists to the utmost if the names refuge and sanctuary are to have any but the most sardonically perverted meaning. Why a refuge should not be a nursery for the preservation, increase, and spread of fishes, as well as of other forms of wildlife, the logical mind cannot see.

Depletion of the breeding stock of fishes in a refuge is just as much a perversion of its purpose as would be the shooting of a deer or a duck. Moreover, the presence and movements of fishermen on a wildlife sanctuary are inimical to the primary purpose of the reservation. If not forbidden at all times, they should at least be prohibited throughout the entire breeding season of waterfowl, at which time they cannot be other than an adverse influence. Intrusion of any sort in areas set aside for the preservation of wildlife to some extent involves negation of their primary purpose, and trespass for fishing should be barred just as are all other forms of trespass, whatever their nature.

On areas that are not specifically set aside for the propagation and maintenance of wildlife, other factors come into play and recreation usually is an important use. Under existing policies, fishing is accorded a high place and more money is spent upon hatcheries and fish distribution, perhaps, than for the support of any other single objective. Again the Nature lover must ask just why the providing and maintenance of angling should be functions of a place of recreation for the entire public? In areas where the seeing and enjoying of free and unmolested terrestrial wildlife are acknowledged highly important shares of the recreational advantages, why is aquatic wildlife, specifically fishes, turned over to the tender mercies of people whose enjoyment of the outdoors is based on destruction?

Holding streams and lakes of value chiefly as a means of providing fishing involves unwarranted depreciation of their scenic value and of their interest in many ways to those who really appreciate Nature. Those who can round every bend in the stream with an anticipatory thrill of discovery, who can admire in detail and thoroughly enjoy every reach, and ripple, and fall, have a more complete, as well as a more innocent, recreation than any killers of wildlife. One who is content to approach a stream with such care that he can see and study the fishes unalarmed takes nothing away that may contribute to the enjoyment of the next visitor, an advantage for his method that should be given full weight by officials formulating policies affecting public recreation. We hear a great deal about devoting areas to their highest use, but if that criterion were actually followed no destructive use would ever be given preference over a non-destructive one. To favor killers over conservers is to contradict claims for superiority in culture and advance in civilization.

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# Manitoba Ducks

It is with pleasure that we print the following letter dated March 28, 1938, from Mr. C. L. Broley of Winnipeg, Manitoba, Canada, his comments shedding interesting light upon the duck situation, and the letter speaking for itself, as follows:

During the past year I have read with interest your articles on waterfowl conservation. They are always powerful and right to the point and I am sure they must be causing much constructive thought among your readers. So more power to your conservation articles.

Our ducks certainly need your support. Even in Manitoba, right in the heart of the breeding area, we see the need of restricted shooting privileges, or, better still, two or three years of closed seasons. Two years ago I was vice-president of the Manitoba Game and Fish Association. We placed a resolution in our minutes favoring a closed season for 1936. Our president, a capable, hard-working, and conscientious officer who has accomplished much good in the way of conservation, was not quite so pessimistic over the 1936 duck situation as some of the other members, and did not think a closed season really necessary.

Our open seasons are too long and should be cut down. A daily or season limit of a certain number of birds is in my own opinion absolutely worthless. How is any game warden to know how many ducks a hunter takes in a day or how frequently he goes shooting? Then again, I have heard of men who after first shooting four or five teal were able later in the day to get ten mallards or other large ducks, and they would then throw the teal away. However, our average hunter did not get ten ducks a day last season. He was lucky if he got five. What a change from ten years ago! I used to enjoy a little duck shooting in a moderate way but I hung up my gun six years ago. I had made up my mind to stop shooting when our ducks began to get scarce and I never expect to take the gun down again.

In some localities birds seemed somewhat more plentiful last fall, but these were concentrations. Other grounds, fifty miles away, previously good areas, had no ducks whatever. It is most difficult to take a fair estimate of decreases or increases.

Many hunters who have been unable to shoot any ducks or chickens will shoot at the first bird that comes along. They must kill something before they go home. The small .22 rifle is a curse. A respectable Canadian citizen must obtain a permit to carry a revolver, but any irresponsible youth can carry a .22, and many of them shoot everything they come to. Last spring I took three rifles from three young men who were shooting at Hudsonian godwits, a bird that is becoming rare.

After a wonderful March, our weather has turned very cold and no ducks have arrived as yet. I shall keep you advised as you request.

In fulfillment of this promise, he writes under date of May 19:

Now as to the spring duck situation. I cannot see much change from last year among the mallards and pintails and scaups, but I do think canvasbacks, redheads and ruddies are becoming scarcer each year. I was up to the marshes of Lake Manitoba on Sunday. So far I have not seen a ruddy this year. I examined a slough near Portage la Prairie that has always contained canvasbacks and ruddies and where they always nested, and there was not a single duck on it Sunday.

# HOW ABOUT MY KILLING YOU?

*By* JOHN H. BAKER

*Executive Director, National Association of Audubon Societies*

**When we received the material that makes up the pictorial feature, "Grackles as Marauders," which leads our rotogravure section this month, we recognized it as both controversial and as involving the fundamental issue of control of any species of wild life for the benefit of others. We also thought that it might sustain the hand of the National Association of Audubon Societies in any control at Green Island that might scientifically be proved necessary. When this feature, in type, was submitted to John H. Baker, executive director of the Audubon Societies, we found that such control at Green Island was not felt to be justified by the existing facts. Mr. Baker asked the privilege of presenting his views based on a study of the situation this spring, and these views are, with pleasure, here presented.**

**In theory in the heartiest accord with a policy of non-interference with any wild life species, we do not believe it to be a policy that can be slavishly followed in every instance. In cases where natural conditions prevail, of course, no control, even of predators, need be exercised. But man has so upset the natural balance by civilization that wild life enjoys few such Utopias. Therefore, in the unnatural situations under which wild life, for the most part, must exist, scientifically proved control of some species may be necessary because the natural balance has been disturbed.**

**It is interesting to note that at Green Island, under ideal conditions of no visitors, photographers, banding, nest-marking or daily counts, thirty per cent of the reddish egret eggs in 100 recorded nests were destroyed. What, then, might have been the depredation had the disturbance of visitors and photographers and other activities been allowed? It is of the loss under such conditions that Mr. Pederson writes in our rotogravure section. We should like to see this experiment repeated another year.**

It is consistent with human nature that we should have preferences, yet insistence on a preferential attitude in behalf of one form of animal as against another lies at the bottom of much delay in solving our conservation problems.

The Society for the Preservation of the Cardinal or Chickadee is apt to be in violent warfare, for example, with the Society for the Preservation of Sunflower Seeds. Those who like to shoot are apt to spend great amounts of time and money trying to give perferential treatment to game species at the expense of others.

It seems to me that there is no such thing as a harmful species of animal; that every species is beneficial, having its rôle to play in maintaining that natural balance which is of the greatest economic benefit to mankind; that every species may be temporarily or seemingly harmful to man's local interests at a given time and place.

As a direct consequence of carrying into effect preferential attitudes, we become engaged in many forms of deliberate control of animal life, and then find, to our bitter disappointment, that these controls are futile or have adverse boomerang effects through their impact on animal populations that are part of the food chains involved.

Our warden at the Green Island, Texas, Sanctuary has regularly complained of the destruction of reddish egret eggs by great-tailed grackles, and has requested permission to shoot grackles. In order to simplify analysis of the facts in the case, instructions were issued that during the 1938 nesting season no visitors would be allowed on the island, no photographers, no banding of nestlings, no marking of nests, no daily counts made. Any or all of these might be contributory factors in egg destruction.

At our request, Dr. Walter P. Taylor, in charge of the Wildlife Research Station at Texas A. & M. College, kindly delegated Mr. Tarleton Smith to conduct field research at Green Island for two weeks during the height of the egg-laying season of the reddish egrets. For the first time, we have data on which to base comparisons in future years. Mr. Smith reports that thirty per cent of the eggs of reddish egrets, in one hundred nests of which detailed records were kept, were destroyed by great-tailed grackles during the two weeks. The warden's attitude, quite naturally, is: "every time I see an egret's egg destroyed by a grackle, it burns me up".

Now the most interesting feature to me is that, in spite of that natural predation, there has been successfully reared at Green Island this season a fine crop of young reddish egrets, as I myself witnessed in June, and our warden states that, by his own count, there are as many reddish egrets at Green Island this season as ever in his experience.

May not some thirty per cent loss of eggs from that cause be approximately normal and have occurred through eons of time? What assurance have we that more young egrets would have been successfully reared to maturity if the grackles had been deliberately controlled? Granting such greater crop, what assurance have we that the total supply of reddish egrets would be beneficially affected over a reasonable period of time?

At another of our sanctuaries in Texas, where there is a dense nesting colony of mixed roseate spoonbills,

egrets, herons and ibises, our warden carries his natural preferential attitude to the point of begrudging nesting sites to the egrets, herons and ibises, because he prefers a solid colony of spoonbills.

Many persons reading this article may be sympathetic with the idea of controlling grackles, but I doubt if they would fancy destroying snowy egrets in the supposed interest of spoonbills. Yet the cases are identical.

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# A Day Is Born

Stealing across the eastern rim
Of night's full cup
Approaching day awakes—
Would of night's shadows sup,
Embrace, entwine
Quaff her nectared wine.

Then all too soon
Warned by a watchful moon
Night stirs before day's grasp
Gathering somber robes,
Retreats
Leaving in her wake
Gorgeous day to slake her thirst
As best she may.

As throat of lark, full poised,
Waits to enthroat
Its rising note,
Day hesitates
Then pealing, upward sprung,
Full notes of day are flung.

With shafts of light retreating,
Night is pierced
And stung;
Reeks of her spilling wine.
While loitering cloud
Casts aside her shroud
Day's colors to entwine.

As preening bird in crooning notes
Is heard to cast her morning song,
Idles the coming dawn.
'Neath spangled crown of purpled cloud,
Shafts of haloed light
Disperse the shadows of the night.
A day is born.

# An All-Season Annual

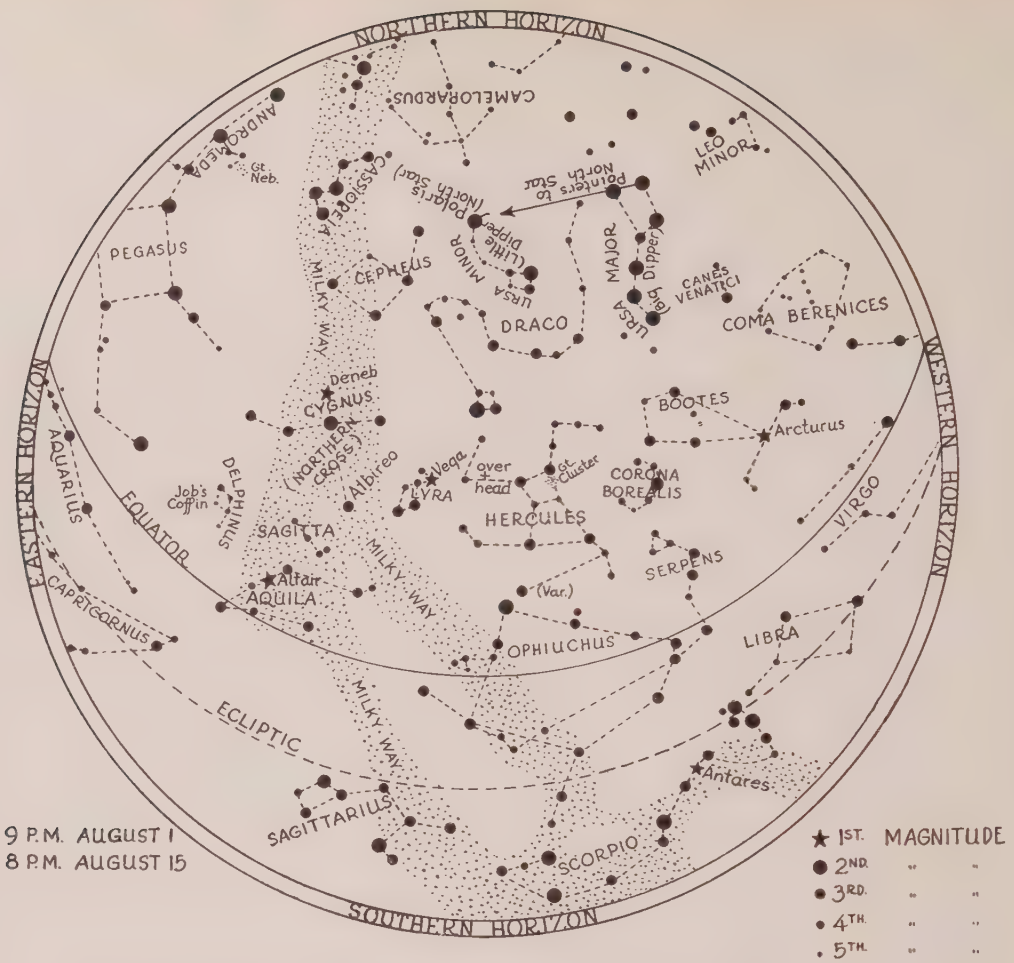
*By* VICTOR H. RIES

Those who garden with annuals often have difficulty in finding one that will bloom all summer and yet not bloom itself out, or die from the heat or some other reason. That is why we usually see the same annuals in parks and show gardens—verbena, California poppy, zinnia, marigold and others.

A relatively uncommon annual that has grown in popularity recently is the annual cup flower, *Nierembergia gracilis.* Its dainty lavender flowers, an inch in diameter, somewhat resemble miniature petunia blooms. The slender leaves resemble those of the hardy flax. In fact, its effect in bloom is somewhat a combination of the two. It is fairly easy to grow from seed, the one difficulty being that seed of its upright-growing sister, *N. frutescens,* is often supplied in its stead.

The cup flower grows about a foot high with a spreading growth of eighteen inches or so. Once it starts blooming it will continue until frost. Being of about the same hardiness as the petunia and snapdragon, it should, with a little protection, winter over in the more temperate sections, or it may be dug up and stored in the cold frame, or even kept as a house plant. It is unexcelled for the rock garden, window box, urn, front edge of flower border, or for planting along a rock wall.

A new form, *N. hippomanica,* is slightly more dwarfed and compact. Seed should be sown in the cold frame in early spring, or better still, in the cool house or greenhouse for earlier bloom. Once you try it you will continue its use.




To use this map hold it before you in a vertical position and turn it until the direction of the compass that you wish to face is at the bottom. Then below the center of the map, which is the point overhead, will be seen the constellations visible in that part of the heavens. It will not be necessary to turn the map if the direction faced is south.

# News from the Heavens

*By* ISABEL M. LEWIS

SOMETIMES the uncertainty in the measurements of the distances of the stars disturbs us. One of the most difficult facts for the human mind to grasp is the immensity of space and the difficulty that we encounter when we attempt to measure it in ordinary understandable terrestrial units. It is an easier matter when we deal with our own little family of planets and their satellites. The distance from the earth to the sun, only ninety three million miles, furnishes an excellent yardstick. The outermost planet, Pluto, is only about thirty-nine and a half of these units distant from the sun, and light, with its velocity of 186,000 miles per second, comes from the sun to the earth in about eight and one-third minutes. It reaches the orbit of Pluto about five and a half hours after it leaves the sun. But four and one-third years pass before that beam of light reaches the nearest star, and the distance of that star from the earth is as great as the distance, in general, that other stars are from their nearest neighbors. That is why so few stars have close heavenly encounters even though they are all in motion.

Two units are used in measuring star distances. One is the light year—the distance that light travels in a year at the rate of about 186,000 miles a second, which is about 63,290 times the distance from the sun to the earth. The other unit is the parsec, which is 3.26 light years. The word is a combination of the first syllables of "parallax" and "second," and expresses the thought that it is the distance of a star with a parallax of one second of arc. No star is close enough to the earth to have a parallax that great. Proxima Centauri, a faint star a fraction of a light year closer than the well-known star of first magnitude, Alpha Centauri, has a parallax of only seventy-six hundredths of a second of arc, which means that if, *at the distance of this star,* we could view our solar system and see our planet earth—which of course we could not possibly do even with the aid of any telescope in existence—then the distance between sun and earth would be only this fraction of one second of arc in angular measure.

There are known to be, within a distance of ten parsecs

of the earth, or 33 light years, 127 stars. How many more there may be with distances still unmeasured we cannot say. Of this known number some are brilliant stars of first magnitude, or brighter, some are faint dwarf stars visible only in the most powerful telescopes.

The distances of these nearest stars may be said to be known with a high degree of accuracy; that is, within one or two light years and there are included in this number nine stars of third magnitude, *or brighter.* These brightest of the nearest stars and their distances are; Alpha Centauri, 4.3 l.y.; Sirius, 8.7 l.y.; Procyon, 11 l.y.; Altair, 16 l.y.; Beta Hydri, a southern circumpolar star, 23 l.y.; Fomalhaut, 25 l.y.; Vega, 27 l.y.; Zeta Herculis, 30 l.y.; Pollux, 32 l.y.

When one comes to measuring the distances of stars that are so far away that the trigonometric method, as it is called, no longer is reliable—and that applies to stars that are not even one hundred light years from the earth —then other methods are used. It is not possible to go into these here, but some of these methods give reliable estimates of the order of distance of the stars, although it is generally understood that these distances may be, and usually are, uncertain by as much as one-fifth of their values. The discordant values that we sometimes see given for the distance of some well-known star is due to pushing the direct measure of parallax too far, in some cases, and attempting to measure an angle that is too small to be measured at all accurately in that way. The Pole-star, for example, is a star for which some very discordant values of the distance have been given, because it is too far away for reliable measures of its parallax to be made, by the direct trigonometric method.

So far this year there has been a dearth of comets. By the end of June, last year, five comets had been discovered, either new or periodic, and before the year was over nine comets were under observation. One of these comets, known as Finsler's, became bright enough to be faintly visible to the naked eye. Only one comet has been discovered so far this year, namely Gale's comet, which has a period of eleven years and was found by Mr. Cunningham of the Harvard College Observatory. He discovered it on a photographic plate on May 1, after a search for several months of the region where the comet was expected to be picked up on its return. It is unlikely, but not impossible, that the large number of comet discoveries of 1937 will be equalled or surpassed this year, although comets have an interesting way of appearing, sometimes, when least expected.

Amateur astronomers who are interested in making observations with telescopes of their own construction, or purchased through their interest in astronomy, will find lunar observations always a prolific field of investigation. British amateur astronomers are doing some excellent work along this line, and have discovered and mapped some unknown or poorly identified markings in regions along the limb that are visible only under favorable librations of the moon in the neighborhood of the lofty lunar peaks of the Rook and Cordillera Mountains. Other observers have been interested in recording strange and periodic changes in brightness in four light spots on the floor of the lunar crater Schickard. There are many regions, especially on the floors of well-known lunar craters, where periodic changes have been suspected. Many excellent maps of the lunar surface give the location and names of all the various types of lunar features, walled plains and craters, mountains, maria, rays, rills, and such, in great detail.

If one has access to a telescope of moderate size a most interesting object is Satellite III of Jupiter, named Ganymede. Both this satellite and Satellite IV, or Callisto, are not only much larger than our moon, but also exceed the planet Mercury in size. Satellite III has often been observed to be elongated in appearance, and many explanations for this peculiarity were offered before it was generally agreed that it was due to the fact that the surface had dark markings which produced the elongated appearance. This satellite is the brightest of the four Galilean satellites, as they are called, and was long believed to be the largest. Most recent measurements indicate that Satellite IV is slightly larger, and is, in fact, the largest satellite in the solar system. There is much diversity of opinion as to the color of Satellite III. Some see it white, some pale yellow, and others orange, or even ruddy. Markings on the satellite are best looked for when it is seen projected against the disk of Jupiter. At the last opposition of Jupiter the planet's Great Red Spot was more conspicuous than it has been at any time since 1878. As sun spot activity is known to affect the atmospheres of the planets, it is possible that this was a result of the unusually great sunspot activity of last year. Jupiter is now approaching opposition again and will be in excellent position for observation in August and September. Opposition will occur on August 21, when it will be visible from sunset to sunrise. It will be found lying near the boundary between Capricornus and Aquarius.

Venus is also visible in the southwest these two months. It will be at greatest elongation east of the sun on September 11. It is rather poorly placed because of its southward motion and low altitude and sets about an hour and a half after the sun.

Mercury may possibly be seen low in the West the first week in August, but will not be seen again until a week or so before its western elongation on September 13. This will be the best time to see Mercury in the morning sky this year. It should be visible until a week or more after elongation.

Saturn is visible the second half of the night in August, in Pisces, and in September rises soon after sunset. Mars is in the morning sky but too near the sun to be seen to any advantage. The August meteors, the Perseids should appear in largest numbers on August 11, but may be seen on other nights for two weeks or more. A full moon on August 11 will spoil the display on that night.

## Delayed Conquest

By Charles H. Knight

The indigo bunting is an extremely persistent bird. This fact was revealed to me last summer by the strange devotion a male of this species had for a bit of land he wished to proclaim his own.

One warm day, in late May, as I strolled through a field near my home, I heard a sweet-voiced bird singing: "key-key-key-key, cheet-cheet-cheet". My first impression was that a goldfinch was singing. Upon investigation, however, I found that the singer was none other than an indigo bunting. I finally found him on the topmost branch of an elm sapling, singing with ecstasy. Then suddenly the bright blue form rose like a meteor and flew into the lowest branch of a towering oak near by. Hardly had he reached the lowest branch and begun to sing, than he flew up and up and up until he reached the topmost branch of the tree and after a last breathless ditty dropped to the ground as if exhausted.

The following days he spent chasing intruders and possible rivals away from his chosen territory, and displaying himself as though to attract a mate. He continued these antics for nearly two weeks; but it seemed all in vain, for although it was mid-June, no feathered admirer appeared. Then he disappeared as suddenly as he had come.

Other birds soon took advantage of his absence, and a few days later I observed a pair of yellow warblers building a nest in the elm sapling. They continued working on the nest for several days, and within a week the female began laying her speckled, greenish-white eggs.

Scarcely had the last egg been laid when the indigo bunting appeared again, this time with a mate. His affectionate mate appeared to be held utterly spellbound by her vivacious lord and master and meekly followed him through the bushes. It was not long, however, before the successful wooer spied the warblers. With an angry dash the infuriated bunting sprang upon the interloper and pulled out several beakfuls of bright yellow feathers before the warblers were hardly aware of his presence. But the doughty little male warbler was by no means an inferior combatant. The indigo bunting must have forgotten to reckon with the warbler's bill, for it was not long before the warbler, encouraged by his brooding mate, began to take the offensive. The warbler used its long and slender, but extremely strong, bill with deadly effect and in a short time the would-be vanquisher was vanquished.

All during the quarrel the female indigo bunting had been nonchalantly feeding on the ground and merely flew into an adjoining cemetery when she seemed to realize her mate was being defeated. A few minutes later she joined her fleeing mate, and together they took refuge some distance away.

Although the sparrow-like female indigo bunting readily accepted their second choice for a time, the male seemed extremely restless. His mate soon began building a nest in a small locust tree and proceeded to hatch her eggs. All during this time the male spent a good part of each day in the cemetery adjoining the field of his desire. Several times he mustered up enough courage to invade the field, but was quickly forced to retreat by the ever-jealous male warbler. The fact that the warbler was now a proud father of three vociferous nestlings only seemed to add fuel to his burning hatred.

By the middle of July the indigo bunting was also a father, although he seemed somewhat less enthusiastic than the confident yellow warbler. The bunting now had less time to spare, as he was kept busy by the incessant demands of his nestlings for food. On the ninth day of their existence, I observed the devoted parents feed their greedy offspring twenty-seven times in two hours.

Meanwhile the yellow warblers had vacated their nest and the young birds were virtually self-sufficient. By the end of July the male warbler had ceased singing and had become extremely shy. As they are among the first of our summer residents to leave us, the whole family soon deserted the field, and apparently started on the long journey to their winter home.

Soon the young indigo buntings likewise became strong enough to take care of themselves, and the little family started to wander about. Naturally, the first place the male indigo bunting visited was the field near my home. When he discovered that it was again possible to frequent his chosen haunts, he seemed overjoyed almost beyond belief. From dawn to dusk, with only infrequent rest periods, he serenaded his mate in the grasses below. But August was drawing to a close and migration time for the indigo bunting also had arrived. One day the field rang with glad notes of a conqueror and the next—well, the next day the field echoed with only the fond memories of a summer conquest.

## Albino Bull Elk

By Edward B. Hill

On July 10, 1934, while riding on range inspection in Shoshone National Forest, Wyoming, I saw an elk calf of unusual coloring. His body was white except around the head and along the shoulders, which were a very light brown. I was within twenty yards of him this time. The elk was not seen again until September, 1935, when the guard on this district saw him at the head of Corral Creek in the Crandall drainage. The elk was a yearling at that time, and the patches on his head and shoulders appeared to be a light tan color. The rest of his body was pure white. In February, 1936, enroute from Sunlight to Crandall Ranger Station, I saw three bull elk and was riding up the trail watching them when all at once my horse snorted and jumped, and just below me behind a spruce tree I saw the albino bull elk, not more than fifteen yards away. He was large for a coming two-year-old. He had a small head with forked horns that were cream-colored except the tips, which were light brown. Around the ears, head, and shoulders and the rump, the hair looked dirty but no distinct color.

In September, 1936, during the rutting season, I got a glimpse of the albino bull again. He had a small set of horns that appeared to be four-points. His color was the same as during the winter. The bull was not seen or heard of again until December 11, 1937, when I saw him again on Trail Creek. I approached within thirty yards of him this time. His color is pure white except around the head, down the shoulders and the top of the rump, which are light tan. He has a five point head and the horns appeared to be a cream color, much lighter than the average elk horns. He was much larger than the two bulls he was with, weighing probably 100 or 125 pounds more than they. He seems to be much tamer than the other bulls but this may be due to the fact that he has never been seen off the Hoodoo State Game Preserve and does not show fear of human

## Restless Jungle

To students of Africa's fauna, and esp cially as regards its conservation, the nam of Carl Akeley will always be held in re erent appreciation. Equally notable have bee the efforts of his wife, Mary L. Jobe Akele who was his companion and comforter, an the one who, after his death, assumed charg of his last expedition and brought it to su cessful completion. Later she helped in th completion of the African Hall in the Ame ican Museum of Natural History, and i the details of the National Parks of th Belgian Congo.

In 1935 Mrs. Akeley returned to Afric where for eight months she was able to trav through the more interesting parts of th country, particularly the Transvaal, Natal, Zulu land, Swaziland, and Portuguese East Afric

Her first objective was the Kruger Na tional Park, "the greatest wildlife sanctuar in the world". Her first-hand account of thi great preserve, last stronghold of big gam in South Africa, is rich in reminiscence an history from behind the lines. Other chap ters have reference to such notable animal as the white rhinoceros, koodoo, impalla lion and others.

Mrs. Akeley's interest lies not alone i the wild beasts of Africa; she seems equall interested in the wild people—the Zulus Swazis, and other tribes. Being the kind o person who gains the confidence of nativ people, she was able to learn from then many a story of great interest. To read thes will benefit people of any race, and of what ever stage of civilization, for they teach tha civilization, like beauty, is but skin deep and often not even that. Mrs. Akeley's re lations show that even the fiercest of Africa' tribes have the same instincts as all of us and that their standards of chivalry an honor will put to shame many a more en lightened people.

*Restless Jungle* is published by Robert M McBride and Company, New York.

E. A. P.

## Yosemite Wildflowers

The June issue of *Yosemite Nature Notes* appears as a special number and is devoted to picturing and describing one hundred and one Yosemite wildflowers. It is the joint work of M. E. Beatty, C. A. Harwell and J. E. Cole of the Park's naturalist corps. Copies are available from the Yosemite Natural History Association, Yosemite National Park, California, for twenty-five cents.

## Feeding in the Zoo

Zoo dietetics has often been a knotty problem for those entrusted with the care of animals forced to exist under conditions so different from their natural state. Mortality has been high with various species because of inability to approximate the natural diet of the inhabitants of the cages. More than a year ago, with WPA and NYA help, Dr. L. F. Conti, the San Diego Zoological Society's veterinarian, was able to start bacteriological and chemical research work with the goal of having healthier and longer-lived animals under his care. Studies have been conducted in the San Diego Zoological Hospital, whose patients may be anything from pumas to penguins.

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## Alaska's History

The *Story of Alaska,* by Clarence L. Andrews, is the latest and in many ways the most complete story of that territory. To its preparation the author has brought singular abilities and wide experience. He early made himself familiar with the Russian language, thereby unlocking a door that has been closed to most of Alaska's writers. Always interested in the country, he helped to add to its history when, in 1897, already with an experience of five years in the territory, he joined the party of the Duke of Abruzzi on the famous ascent of Mount St. Elias. Ever since then, except for service in the World War, his main activities have concerned Alaska. He is an enthusiastic believer that the territory, which he calls the Scandinavia of America, has a brilliant and worthy future.

Beginning with its discovery by the Russians in 1741, the author traces Alaska's story through its fur-seeking days, its various epochs under Russian and United States rule, including its regimes under our Army and Navy, the romantic story of its exploration and early development, and its rich resources in gold, copper, and wildlife. Yet, despite the fact that "mining" methods rather than development of these resources have been the rule, Mr. Andrews believes that enough remains to reconstruct enduring natural wealth of great value, but that the attainment of this goal demands constant and intelligent vigilance. Exploitation must cease and all resources must be husbanded and protected.

Mr. Andrews has written a book that is a worthy successor to Dall's "Resources" of 1899 and Bancroft's "History" of 1886. It is painstakingly documented and well indexed.

The *Story of Alaska* is published by the Caxton Printers, Caldwell, Idaho, and sells for $4.00. E. A. P.

## Scenic Tennessee

Anyone planning to tour about Tennessee will find *Scenic Resources of the Tennessee Valley* a valuable guide book. Prepared by the Tennessee Valley Authority with the collaboration of State planning boards, this book of more than 200 pages describes and pictures these scenic resources in detail. The text is supplemented by a number of large and excellent detail maps. Illustration is profuse, and we hope that we will not be considered captious if we observe that the Government Printing Office has no reason to be proud of the halftone reproduction. The book is available from the Tennessee Valley Authority, Knoxville, Tennessee, at one dollar.

## Poetry Contest

Announcement is made by the Chattanooga Writer's Club of the annual Nature Poem Contest established by Robert Sparks Walker in memory of his wife. The contest runs to November 1, 1938, with a first, second and three third prize awards. Space does not permit our presenting here the rules of the contest but Nature poets interested may obtain them by sending a stamped and addressed return envelope to Mrs. James A. Burrow, 300 Glenwood Drive, Chattanooga, Tennessee.

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# THE SCHOOL PAGE ★★★

EDITED BY DR. E. LAURENCE PALMER
*Professor of Rural Education, Cornell University, and Director of Nature Education, The American Nature Association*

## What is New in Nature Education?

This page serves only incidentally the whole program of education fostered by the American Nature Association. During the coming year it will provide at least two types of assistance. There will be an interpretation of surveys and studies made under the auspices of the Association, treating with their significance from the elementary school through the college levels. In addition there will be specific teaching suggestions dealing with definite fields of subject matter and realms of experience.

The Association has planned its program to help schools variously. It publishes NATURE MAGAZINE with a wealth of useful subject matter. It makes surveys of educational activities and publishes the findings in books and bulletins. It has established fellowships for the development of leadership adequate to meet changing demands in the field of Nature education. It encourages such dynamic projects as conservation and roadside improvement on the part of agencies in and outside of the schools.

## Specific School-room Suggestions

During the coming school year—in October, December, February and April—this page will give specific suggestions for teaching materials found in Nature Magazine.

Emphasis will be placed upon the special insert feature in these issues, these dealing respectively with aquatic insects, winter weeds, stars and reptiles. Integrated with consideration of these subject matter fields will be a development of the subjective concepts of protection, heat and light, biological associate relationships and origins and ancestry. This will provide an elaboration of the significant material found in NATURE MAGAZINE'S *Guide to Science Teaching* and in other publications. In this way specific suggestions for teaching of material at different grade levels will be available, and the more recent issues of NATURE MAGAZINE will be made a part of the Association program recommended for school use.

## Educational Surveys

For some years the American Nature Association has sponsored educational surveys dealing with its specific interests. In 1927 and 1930, these were published in book form as *The Nature Almanac*.

In recent years, new angles have been investigated to the end that new recommendations may now be made. Some of these will be published in the Association's *Quarterly Bulletin* issued during the current school year. Others will appear on this page. During the different months special consideration will be given to the needs of elementary schools, junior high schools, senior high schools and junior colleges, liberal arts and land grant colleges and teacher-training institutions.

The basic material for these reports has been gathered during the last two years by extensive correspondence, examination of printed material, cooperative projects of an experimental nature and by wide personal visitation of centers shown to be of interest by the preliminary studies.

The issue of *The Quarterly Bulletin* concerned with school problems will emphasize the service available to the schools through cooperation with federal, state and private agencies, rather than through institutions charged solely with school responsibility. In this connection brief reports will be made of the school service rendered by such groups as the National Park Service, the Biological Survey and the units of the federal government interested particularly in soil erosion, forestry and other fields of work. A brief survey of the activities of importance by state departments of conservation, state parks, state surveys and other state units will also be dealt with in the *Bulletin* rather than on this page.

The *Bulletin* will contain abstracts of the findings of work being done in conservation education by private agencies. Among those recognized as of this type are the Campfire Girls, the Scout organizations, the game and the Nature clubs, professional organizations interested in natural resources, and the commercial concerns that have used public interest in natural history to further their own economic prosperity. Frequently these private concerns have been responsible for excellent educational activities, as illustrated by the series of pictures published and distributed by Arm and Hammer Soda, Coca Cola and Sinclair Oil products. A simple directory and frank analysis of these projects should be useful to schools in interpreting their environment. The American Nature Association recognizes an obligation to schools in making an attempt to make these evaluations. The *Bulletin* is free to members of the Association and is scheduled to be published in October.

## Fellowships

For some years the American Nature Association has been responsible for fellowships designed to develop leadership in Nature and conservation education fields. Former holders of these fellowships, and individuals helped by these funds, now hold important positions from coast to coast in such institutions as Cornell, Dartmouth and other universities, and in such states as New York, California, Minnesota, Ohio, Tennessee and in foreign lands.

One holder is at present carrying on a survey of the educational activities of biological field stations of Europe following an initial survey of these institutions in America. These fellowships in the past have been held only by experienced teachers who hold master's degrees and have a reading knowledge of French and German. The holders have made personal surveys, during the course of their studies, of all states east of the Rockies and have brought with them knowledge of conditions in the Pacific coast states. In most cases, the studies have been carried on in connection with work for the doctorate. They have been of the fact-finding type and have been as free as possible from bias by any particular interests or viewpoints.

During the year 1937-38, the fellowship have been held by Mr. Richard Weaver, Mr. John Arnold, Mr. Charles Quaintance and Mr. Homer Jack. Mr. Weaver investigated the problems of federal agencies and during the course of his studies visited twenty states. Mr. Arnold investigated state agencies and visited the mid-west and New England states. Mr. Quaintance investigated schools and when this appears in print will be making a series of personal visits to the Atlantic coast states south of New York. Mr. Jack studied the field biological stations and is continuing this study at this time in Europe.

The cooperation of members of the Association and readers of this page in making these studies successful is sought and suggestions for further worthwhile studies are welcomed.

## Professional Outlook in Nature Study

There is much to indicate a revival of interest in the field of general Nature study. Courses bearing this name are being introduced at the high school level. The whole conservation movement calls for leadership of individuals with broad training as well as of those with skills in particular fields. The problems of wildlife management involving the control of natural associations call for individuals who can coordinate the work of the botanist, politician, geologist, engineer, physicist, psychologist, chemist, educator, economist and others. Much of this leadership must call for the services of the good old-fashioned naturalist who may prove not to be so old-fashioned after all.

The new philosophy of life calling for shorter working hours and more leisure in all classes of society creates a demand for wholesome hobbies. Among these will be many associated with Nature subjects. This need is being recognized in a number of places, notably this year at Dartmouth College. There, a full time naturalist without classroom obligations, but with free time to help and encourage college students to enjoy living wildlife and natural history problems, has begun work. It is felt by some that interests in natural history may be of value through a greater span in human life than is possible for individual participation in athletic events, for example. The Dartmouth venture is an attempt to pioneer in this field in a new way. The naturalist taking over this very real responsibility recognizes something in Nature study that would appeal less to the maiden aunt and more to the explorer of the remote or the immediate wilds.

Inquiries have come to the American Nature Association for suggestions of persons qualified to represent state conservation departments in the public schools. Such persons must have not only the ability and training of the general naturalist but an understanding of the school situation as well. The persons holding such positions must visit the elementary schools and the colleges as well. Where can such persons be

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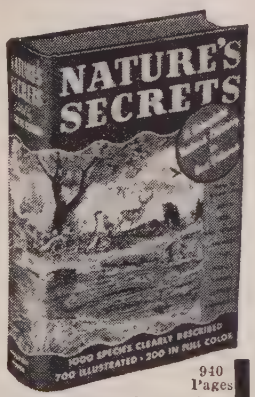


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## NATURE'S SECRETS

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found?

The establishment of the centers for the training of wildlife technicians provides an outlet for the offerings of the general naturalist. Should these continue to expand there will be a demand for persons specifically trained for these jobs. It is ridiculous to assume that the obligations of the situation can be adequately assumed by persons trained primarily, for example, to raise and harvest trees.

The Wildlife Federation, the Wildlife Institute and the Wildlife Society have, with similar organizations, indicated a renewed interest in schools as a vehicle for bringing about changes in public policy as they affect wildlife. There is constant pressure being brought upon these influential groups to lean towards ventures of the propaganda type to meet the interests of selfish groups. Such activities have no place in an educational system. It would seem that the whole situation is being handled intelligently. As the movement grows there will be a call for decentralization of authority to meet local needs that cannot be adequately understood by any one group. This will call for genuine professional service if the problems of the various groups of society interested in or dependent on wildlife are wisely solved.

Added to these problems comes the responsibility associated with the growth of science teaching, particularly at the elementary school level. It can no more be denied that the situation will call for training centers where prospective elementary school teachers can learn to know their way around outdoors, free from the covers of books, than it can be denied that there is a greater interest in this sort of thing at the elementary level. The American Nature Association welcomes these opportunities for service and invites the cooperation of its members in their solution.

### Attention, Herpetologists

John Werler, 482 Park Avenue, Weehawken, N. J., is an amateur herpetologist and would like to correspond with others, especially those interested in snakes. He asks correspondents to state age, and offers to answer any question that he can, and to send material whenever possible.

### A Book of Poems

*Gossamered Glory* is the title of a little book of the collected poems of Ida Elaine James. Here and there among them are some delightful Nature poems. Mrs. James has a sure choice of words and her poems are clear, direct, and enjoyable reading. There is a vein of sadness in many of them, which makes us wonder why so many of the better poets have to be sad about things. The book is published by Poetry Publishers, Philadelphia, at two dollars.

### Moon Mountains

A member of an expedition of the British Museum to East Africa, Patrick M. Synge writes of this trip in *Mountains of the Moon*, the name given to the Ruwenzori. The expedition went out to study the flora and fauna of this region of equatorial snows and glaciers, and adventure is involved in any such undertaking. The story of both the adventure and the natural history finds of the party is fascinatingly told in this volume, which is published by Dutton at four dollars.

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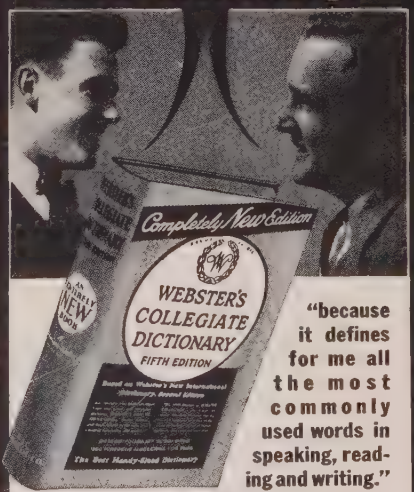


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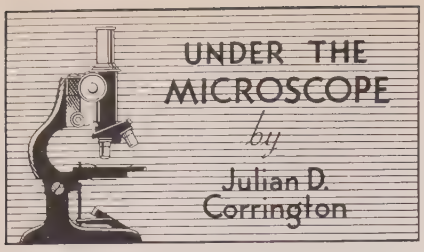



## THE MICROSCOPE AT THE SEASHORE

We are now in the midst of the call of the summer vacation and the annual American hegira to waters, woods and mountains. Be sure to take your microscope along so that this inanimate companion will be available for plenty of novel materials you will encounter.

This year we're going to the strand and will have to reserve discussion of other places for other times. Even so, there is so much to cover that it will be necessary to select a single group and concentrate on the *hydroids,* one of the most fascinating of all types of living creatures when observed beneath the lens.

Hydroids are marine relatives of hydra, the subject of our preceding installment, and form a logical sequel to that chapter. The unit hydroid, called a *polyp,* is essentially a hydra, but these animals, so long thought to be plants by early naturalists, are *sessile*—that is, fixed and rooted in one spot—and are *colonial,* with many individuals growing from a common stem, each on its own special branch.

Preserved specimens, or fixed and stained slides, are highly interesting, but compare with the living colony about as the old-fashioned stuffed wildcat would with the active and graceful feline in the flesh. Really to understand and appreciate these lowly polyps one must study a living piece of a colony in a watch glass of sea water and observe their movements and feeding habits.

To descend from generalities to the particular, supposing we describe *Obelia,* one of the best-known and most abundant of the many types of hydroids to be encountered along our coasts. Colonies are to be found growing from the low water line to a depth of some forty fathoms, attached to rocks, wharves, pilings, shells and to such seaweeds as *Laminaria* and *Fucus.* Various species of this genus occur along the principal coast lines of the world, but are cold water forms. On our Atlantic seaboard, for example, *Obelia* is found from Labrador south to Long Island Sound.

One of the favorite methods of collecting these and other colonies is by scraping wooden pilings below the water level at low tide, and a special form of net can be made by taking an old and dull sickle blade and attaching a net ring to it, the bag hanging below and the long pole handle projecting upward. The curve of the blade fits wooden piers and dislodges into the bag countless sessile animals of many types. Specimens are transferred to fingerbowls of sea water and thence carried to one's workshop, hotel room, or other place of study.

The individual organism in *Obelia* is known as a *hydranth,* and is like a hydra with a larger number of solid tentacles surrounding the mouth opening. Both body wall and internal cavity continue on down the stalk, which attaches the individual to the common stem or *hydrocaulus,* and down this to the *hydrorhiza,* which serves like a root to anchor the entire colony. The common body wall of this whole structure comprises the living, fleshy part of the colony, the *cœnosarc* (Gk. common-flesh) and is surrounded by an external skeleton of chitin, the *perisarc* (around the flesh), covering all of the hydrocauli, stems and hydranths, ending at the level of a polyp's mouth in the *hydrotheca,* a cup-shaped expansion over which the tentacles dangle.

An important biological phenomenon illustrated by *Obelia* is polymorphism, the presence of several different kinds of individuals in the same colony. Such diversity also exemplifies the principle of division of labor, some of the animals doing one job, others performing different tasks.

Thus, in *Obelia,* the hydranths are feeding polyps and cannot reproduce. As the colony matures and increases in size and complexity, another type of polyp, the *gonangium,* arises in the angle where a hydranth stem springs from the hydrocaulus, and these have solely to do with reproduction. They cannot fee themselves and must be nourished by th hydranths. Each gonangium consists of a cer tral column of cœnosarc, the *blastostyle,* o which are produced by the asexual process c budding, individuals of a third type, th *medusa buds.*

Around the gonangium the perisarc termed the *gonotheca* and is a complete cove ing save for a small terminal opening to a low escape of the medusæ when these are rip and break away from the parent colony. Spe cies thus provided comprise the suborde *Calyptoblastea* (bud within a sheath). Tw other prominent genera in this group ar *Campanularia* and *Sertularia,* both cold-wate types, the latter having pairs of oppositely placed hydranths without stems.

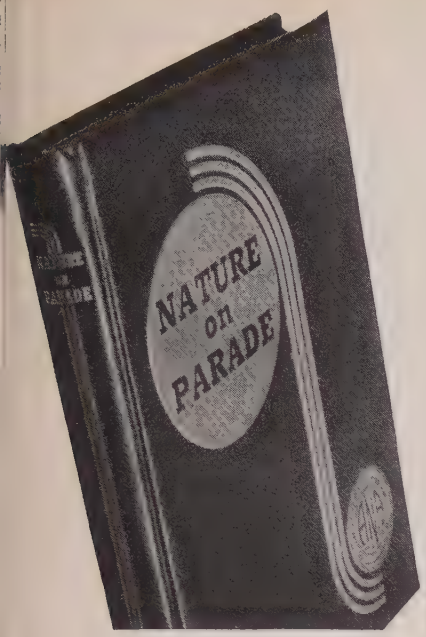
Members of the suborder *Gymnoblaste* (naked buds) usually have a perisarc alon the hydrocauli and stems but not over th hydranths or gonangia, which are accordingl exposed. Here may be mentioned *Bougain villea,* forming large and much-branched colo nies and ranging from Cape Cod southward *Pennaria,* in which the hydranths have tw kinds of tentacles, a basal group like those o *Obelia* and short knobs along the sides farthe up, medusa buds also growing from the side of the hydranths, and distributed from Main southward; *Tubularia,* from Massachusett south, is very large as polyps go, and has on basal and one distal row of tentacles, and medusæ attached to the hydranth between these two rows.

The medusæ of hydroids grow into small jellyfish and are sexed, being either male or female. When mature these shed their germ cells into the surrounding water and the fer tilized egg develops into a swimming larva which later settles down and founds a new colony of hydroids. There is, hence, an alternation of generations in these forms, a rare phenomenon among animals though well nigh universal among plants. The sessile colony of hydroids produces medusæ by the asexual process of budding; the medusæ give rise to new hydroids through the sexual process of fertilization—an asexual generation alternating with a sexual one.

Here is further division of labor; the hydroid generation multiplies individuals; the medusoid generation effects dispersal to

ONE STRAND FROM A COLONY OF PLUMULARIA

SETULARIA HAS OPPOSITE POLYPS WITHOUT STEMS

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new waters. Truly a marvelous and highly successful scheme of living.

The hydroid colony is like one that would be formed by a hydra if all the buds remained attached to the parent instead of breaking away. Doubtless this failure to separate led to the establishment of sessile colonies in times remotely past, and since then two distinct trends have been manifest. In one, the hydroid generation is gradually suppressed until it is dropped out altogether, the medusa becoming the sole type of animal, as is the case with numerous relatives of *Obelia*. The opposite trend took place among other groups, and especially in the anemones and corals, in which the medusa has been lost and the polyps reign supreme.

Polymorphism also undergoes progressive evolution, reaching its climax in such a form as the celebrated Portuguese Man-of-War, denizen of the Gulf Stream, in which one individual serves as a float; others are but long and powerful tentacles, without mouths, and serve to defend the colony and capture food; still others are no more than stomachs to digest the prey, and finally there are individuals assigned solely to the rôle of reproduction. These beautiful creatures, looking so much like a single animal but actually a highly specialized colony of different kinds of animals, can capture and digest fishes as large as a full-grown mackerel, and their stinging cells are so potent as to constitute a positive danger to human life.

For making permanent slide mounts, hydroids are narcotized by adding to the watch glass of sea water, in which the living colony has been placed, a few crystals of chloral hydrate or of epsom salts, from time to time, until the polyps are fully expanded and insensitive to touch—no longer able to contract. Then kill and fix with hot Bouin's fluid or corrosive acetic, stain and mount in balsam, following the technique given in the June-July issue for hydra. Prop up the cover glass with a few bits of a broken cover glass to prevent crushing the polyps.

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## Advanced Hints

Preparation of diatom material for slide making involves a number of chemical operations that seem laborious, yet a single set of treatments will outfit many a slide. We are indebted to diatomaniac H. W. H. Darlaston, of Birmingham, England, for the following procedures:

1. Fresh diatoms. The presence of diatoms in a roadside ditch is indicated by a brown film on the surface of the mud, under water. Scrape off some of this film with a spoon and put into a jar of water. On reaching home, strain first through coarse muslin to remove larger stones and soil particles, then put strained material into a clean jar and fill with water. Allow to settle for an hour, then place jar under tap and turn on a gentle stream of water, leaving for twelve hours or overnight for flushing. Stream must be very gentle to avoid washing away all diatoms. At the end, the water in the jar should be perfectly clear, with fine sediment on the bottom.

Stand jar in daylight for six hours, when the diatoms will be found all collected on the surface of the jar sediment. Remove them with a pipette and either proceed to clean (below) or store in 5 per cent formalin if more convenient to do this work later.

To clean, boil the diatom material first in strong hydrochloric acid. This should be done

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- At left, top, Bausch & Lomb New Gem, a *precision* amateur microscope, 75 to 172 power, $14.50. Center, Model H, at $135, is one of the complete B&L line of laboratory and research microscopes, $38 to $774.50. Bottom, "Adventures with the Microscope," 455-page book by Prof. Julian D. Corrington, $5.00; free with Bausch & Lomb Model R microscope at $21.
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in test tubes or other small vessels, using small amounts of acid and avoiding spilling the acid or inhaling the fumes. The fireplace makes a good chemical hood for this purpose. Wash in several changes of water by filling the tube with water, allowing the diatoms to settle, then carefully decanting (pouring off) the water. Repeat two or three times.

Next boil in strong nitric acid and wash as before; then in sulphuric acid, and, while still hot, add a few small crystals of potassium chlorate. This will cause a violent effervescence and must be done carefully in an open dish, such as a porcelain evaporating dish. Continue to add potassium chlorate until the violent effervescence ceases, then wash in several changes of water, as before, and the cleaning is finished.

Why all of these complex procedures? The hydrochloric acid kills the plants and removes all calcium salts; the other acids remove organic matter and the potassium chlorate bleaches. None of these acids attacks silica. One word of caution: never pour water into sulphuric acid, the resultant heat generated is terrific and would shatter the container. If necessary to mix these two, pour the acid into the water slowly and a bit at a time. Do not pour acids into household sinks.

2. Diatomaceous earth. Break up by stabbing with a screw driver or ice pick, avoiding pulverizing. Put a layer of small pieces of this earth into a dry saucepan and cover with a similar layer of dry crystals of sodium hyposulphite. Heat over a flame until the crystals are melted and the earth is fully saturated with the absorbed melted hypo. Do not add any water at any time.

Allow to cool for an hour or so, add a few more crystals of dry hypo and heat again to insure thorough impregnation of the earth. Then allow the mass to become quite cold, when the absorbed hypo will have recrystallized and the earth become broken up to its finest particles by expansion of the forming crystals.

Now fill up the saucepan with cold water, producing a muddy mass that will settle in a few minutes into sediment and scum. The sediment will contain all solid matter and broken diatoms; the scum only perfect diatoms, buoyed up by the trapped air within. Skim off this surface accumulation thoroughly and carefully, as long as it continues to form.

With the remaining cleaning processes, handle the sediment and scum separately: the sediment will contain a larger quantity of perfect and broken forms, along with debris; the scum a smaller quantity of perfect diatoms only. Wash first to remove all traces of the hypo, then boil for ten minutes in a strong solution of washing soda. Wash in water. Boil for five minutes in hydrochloric acid. Wash. Boil for five minutes in nitric acid. Wash. Boil for five minutes in sulphuric acid. Bleach with potassium chlorate. Wash very thoroughly.

3. Mounting. The cleaned diatoms may be stored in small vials of alcohol for future use; a separate vial for each preparation. Or they may be mounted at once. Place in distilled water in either case. A single drop of this material is now transferred to a clean vial, which is then half-filled with distilled water. Shake, and examine a drop of this diluted mixture under the microscope to see the amount present. There must be enough diatoms so that one does not have to hunt for them; there should be many visible in a single field of view. But they should not be so numerous as to form masses or lie over and obscure one another. This examination will quickly tell whether to add more water or more diatoms to secure a favorable balance.

Place a thoroughly cleaned cover glass on the table before you and breathe on it, then add one drop of the diatom solution, which will immediately spread out into a thin film. Protect the cover glass with an inverted glass vessel to exclude dust while drying, and, when absolutely dry, put a drop of balsam on a clean slide, invert the cover glass, diatoms down, and place this on the drop of balsam. When the slide has been dried and cleaned, add a suitable label, giving locality where the diatoms were obtained. This makes a locality strew slide. At a later date we will discuss the manufacture of other types.

---

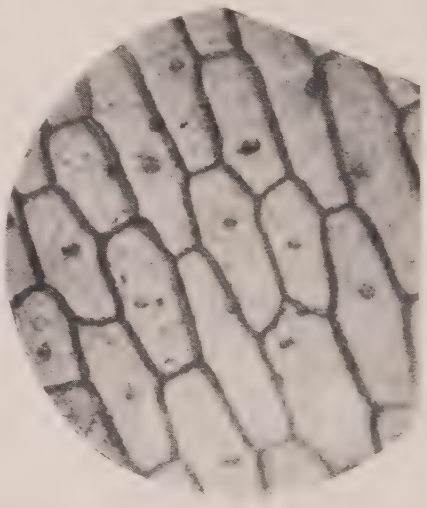
Frequently one wishes to be able to refer to the location of some particular object under the microscope in order to point it out to another observer. Microscopists have a handy language to fill this need. The entire circle of light seen when looking through the microscope is the *field*, and this is treated as the face of a clock in orienting objects. One says that an amoeba is "at four o'clock;" or "toward the center from nine o'clock;" and so on.

## AUGUST-SEPTEMBER PHOTOMIKE CONTEST

*Win:* Miss Jane B. Strohecker, 1822 Perkiomen Ave., Reading, Pa., for "Onion Skin," reproduced herewith.

*Place:* R. G. Harrington, Altedena, Calif., for "Peculiar bulbous protrusions on head of male black widow spider." The spider was raised by Mr. Harrington.

*Show:* Dr. Edward C. Day, San Anselmo, Calif., for "Moth Egg."



**The prize-winning picture conformed most closely to our suggestions as given in the article on photomicrography in the January issue. The subject selected was simple and provided a perfectly flat field, yet the operator managed to obtain a very pleasing depth of focus. The cell walls and nuclei are very clear, the magnification just right to show a number of cells in relation to one another and yet bring out full detail in each individual cell, and the lighting uniform and adequate. The picture gives one an excellent idea of the nature of the simple plant cell.**

## TRADE NOTES

Most recent of additions to the huge me agerie of catalogs issued by Bausch & Lom is their *Medical Microscopes*. Twelve page beautifully illustrated, and describing in d tail the better grade of standard laborato instrument, this catalog should be in th hands of all of our readers who contempla the purchase of this class of microscop either now or in the future. You may ad this item to your hope chest by sending three-cent stamp to Julian D. Corringto NATURE MAGAZINE, 1214 Sixteenth St., N W., Washington, D. C.

* * *

Should you wish to pursue the subject hydroids farther, one of the best texts ar references is *Invertebrate Zoology*, by Robe W. Hegner, well known as an authority ar able writer in zoology. All groups of invert brates are covered in this large volume of 57 pages and 403 illustrations, and it will prov useful many times in connection with anim types yet to be discussed in our departmen The Macmillan Co., 60 Fifth Ave., N. Y City, $3.75.

* * *

Don't forget that entries for the Octob photomicrographic contest must be in ou hands not later than August 12. Come on you fans, and give the mail man some heav work.

* * *

Microscopist (one who uses a microscope) is a tough word to learn to pronounc properly. The first "i" is long, the first "o" short, second "o" long and second "i" short; accent on the second syllable; thus—my-krahs'-ko-pist.

* * *

An item that is extremely useful in mainr taining living cultures of minute or micro scopic organisms—protozoa, algae, hydra rotifers, microcrustacea, worms, and the like—is termed a biological fingerbowl or specime dish. They are of clear glass, shaped like fingerbowl and so moulded as to stack on upon another for convenience in use an storage. One bowl forms the lid for that be low. Four sizes are available from most o the apparatus houses listed in our Januar issue. We recommend the 350 cc capacity priced at 25¢ each; 10% discount by th dozen.

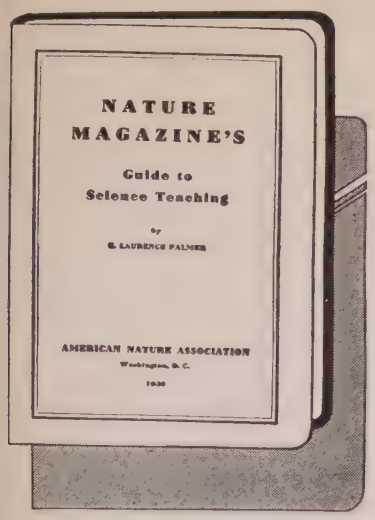
* * *

Shumway's *Textbook of General Biolog* is a readable and well-organized work on this important background subject, discuss ing every field of modern biology. Here on may learn fundamentals concerning the majo groups in the plant and animal kingdoms their structure, functions, development heredity, distribution and evolution. The il lustrations are numerous and well done. John Wiley & Sons, Inc., 440 Fourth Ave., N. Y. $3.00.

* * *

*Under the Microscope* is a department of NATURE MAGAZINE designed for those read ers interested in microscopy and maintains a service to render assistance with problems in this field. You are invited to take advan tage of this service. Address all inquiries to Julian D. Corrington, NATURE MAGAZINE 1214 Sixteenth St., N. W., Washington D. C.

Sincerely,
JULIAN D. CORRINGTON.

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"I think that in general it is a very fine piece of work. It is very valuable for showing how otherwise unrelated pictures and experiences may be used for particular purposes, thus preventing the work from becoming haphazard and incidental." Dr. Victor L. Crowell.

"The approach to this subject is superb and the subject matter of high quality." Dr. W. H. Davis.

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## What About Martins?

From Knoxville, Tennessee, R. E. Gettys writes that he has been host to a colony of martins, numbering about one hundred, every year for the past ten years. This year, however, about a dozen or so arrived, stayed a couple of days and then departed. Mr. Gettys reports, also, that the U. S. Playing Card Company at Cincinnati at one time had one of the largest colonies of these birds in the United States but that they have been diminishing in numbers for the past four years and there are only a few this year. Mr. Gettys wonders if something is happening to the purple martins. So do we, and we would be much interested to hear from readers, who have, in the past, had martin colonies, as to their present status. Also we would like to hear from readers who have recently put up martin houses and what has been their success in attracting residents.

## Nature at Carleton

Recognizing the increasing importance of Nature knowledge, both culturally and professionally, Carleton College at Northfield, Minnesota, has developed a well-rounded and up-to-date program of study in this field. The courses are designed to provide those who realize the value of Nature for relaxation and recreation with means to enjoy such diversion; to prepare individuals for Nature work in summer camps, general science teaching, naturalist service with National or State Park and other phases of Nature study activity; to give those planning intensive work in one or another of the biological sciences a sound background for specialized graduate work. Geographically fortunately situated, the college has an outdoor laboratory with which to work and its own arboretum. It also maintains a Nature trail. A copy of a descriptive booklet entitled *Natural History at Carleton College* is available from the Dean, Carleton College, Northfield, Minnesota.

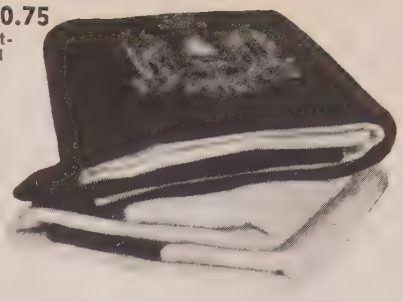
## Isaac Newton

Dealing with the man Isaac Newton, first, and the scientist, second, *Isaac Newton* by J. W. N. Sullivan is a volume that brings to life, in the biographical sense, a man who is a dry figure in most minds. A fascinating character, Newton is treated from a viewpoint that is new, so far as we know, to biographical discussion of the man and his achievements. Drawing upon correspondence and other records, the author has written an entertaining biography and in it treats popularly with his subject's scientific contributions. This biography is published by Macmillan and sells for $2.50.

## Explorer-Naturalist

It is as a polar explorer and associate of Captain Scott that Edward Wilson is perhaps best known, but he was a man with many interests, far from the least of which was Nature. Trained as a doctor, he was also an artist and a sensitive student of the outdoors. This side of his life is brought out in *Edward Wilson, Nature Lover* by George Seaver. Drawing upon Mr. Wilson's diaries and his sketches for text and illustration, respectively, the author gives us a biography of particular interest to other Nature students. The book is published by E. P. Dutton at three dollars.


**$10.75** Postpaid



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# NATURE IN PRINT

**As a convenience to readers the books reviewed in this department of Nature Magazine may be ordered through the book department of the American Nature Association.**

## The Life Story of the Fish

This is the title of a delightful book by Brian Curtis. Those who have spent weary hours searching through dozens of volumes to locate some simple item of fact might be excused for becoming excited at finding so much exact knowledge in one place, even if poorly presented. When such a wealth of information is presented so clearly that any person who is able to read a newspaper can understand and enjoy it, it becomes one of those gems of literature that are all too uncommon in this "dull" world.

There is a temptation to say that the book is crowded with information, but that is exactly what it is not. It is filled with exact statements about the structure and life functions of the fish, but nowhere is there any trace of crowding or of haste; nor is there any suggestion of padding. Every statement is made clearly, simply and completely and yet in so leisurely a manner that the reader feels that there is unlimited time for the discussion of each idea.

Starting with the surface of the body—the skin—the author gives a complete, accurate and beautifully simple account of the structure of the fish. Following this is a series of chapters on the use of the various systems: nervous, digestive, reproductive, etc. The three final chapters apply the previous information in a discussion of some typical fishes and a few that are far from typical. Illustrations and diagrams are clear and simple and really illustrate.

This is a book to read for pleasure and then to keep at hand for immediate reference. Published by D. Appleton-Century and priced at $3.00, it is a beautiful piece of book making. A. C. W.

## New Jersey Birds

No section in our East, perhaps, has a bird fauna that is interesting from so many standpoints as Cape May, New Jersey. By reason of its position and topography it is visited during the year by an extraordinary number of birds. Of the 374 bird species recorded from New Jersey all but 56 have been observed at Cape May.

Although information about the birds of this section began to accumulate in 1623, their detailed history really dates from 1890, when Witmer Stone visited that section. He went there again each summer from 1916 to 1918, and from 1920 to 1937 spent nearly every summer there. The result of his observations, supplemented by those of interested residents and his many fellow-ornithologists, he has now put into book form. The result is a two-volume work, comprising some 941 pages, that takes high rank among treatises on the birds of limited localities. Into this work the author has put the cream of his observations of a half-century of devoted work in his favorite field. Dr. Stone cannot remember just how early he first became interested in birds, but his friends know that his life has been devoted to their welfare.

Of great interest are the chapters on "Old Cape May" illustrated by an ancient map, on the birds of various types of habitat, and on "Bird Migration at the Cape". Most interesting and useful, also, to the bird student, are the charming accounts of habits and observations made through the years on each of the species, by Dr. Stone and his associates.

Most of the species accounts are accompanied by line drawings of the bird represented, and there are 240 half-tones representing birds' nests, birds about their various activities, and suitable habitats. All of the species ever detected in New Jersey are treated, and the book is thus a treatise that may be used with profit by the students of neighboring States.

It is appropriate to mention that, largely through the efforts of Dr. Stone and his associates of the Delaware Ornithological Club, a part of Cape May Point has been established as a wild life sanctuary, under the auspices of the National Association of Audubon Societies. This will afford much needed protection to both plants and animals. Its establishment has resulted in a change for the better of the local viewpoint on the value and rights of wild things—this in a place formerly noted for flagrant violation of the rights alike of birds and their friends.

This splendid two-volume work, *Birds of the Cape May Region,* may be obtained from the Delaware Ornithological Club, Academy of Natural Sciences, Logan Square, Philadelphia, for $6.50, which includes carriage. We can think of no way of investing this amount to better advantage. E. A. P.

## Story of the Bison

*The American Bison* by Martin S. Garretson is the story of the virtual extermination of this North American mammal as a wild species and its partial restoration under federal protection. The author is secretary of the American Bison Society, the organization that led the fight for the bison, and this volume is the history of the fate of that animal and the struggle to preserve it from complete extermination. As such it is a record that can well be read as an example of man's effect upon a wild species, and from it may be drawn many conservation lessons. The book is published by the New York Zoological Society at $2.50.

## Audubon Society Birds

Descriptive of the principal birds in the southern sanctuaries maintained by the National Association of Audubon Societies, *Beautiful Birds of the Southern Audubon Sanctuaries* is an attractive bulletin of the Association. Prepared by Alexander Sprunt, Jr., supervisor of these southern sanctuaries, the text is ornamented by eleven color plates. The pictures are of the roseate spoonbill, wood ibis, eastern brown pelican, great white heron, herons and egrets, night herons, eastern glossy ibis, white-faced glossy ibis, and white ibis. Copies are available from the Association, 1775 Broadway, New York City, at one dollar.

## Bird Scrapbook

*A Book of Birds* by Mary Priestley is collection of writings about birds, both prose and poetry. The author became a bi lover and, as a consequence, began to re widely about birds. Wishing to preserve son of the outstanding material she came acro she started a scrapbook. This followed a c ordinated plan that has now been transmitt to the completed text. The locale is primari British, but the book has general intere both for its literary and informational valu as well as for the fact that it is a uniq avian anthology. It is published by Ma millan at $2.50.

## Hunting Plants

According to F. Kingdon Ward, northe Burma and Tibet are the answer to the adve turing botanist's prayer, and in *Plant Hun er's Paradise* he tells a fascinating story collecting in these regions. The result is book of adventure, natural history fact ar geographical interest. Seeking plants, the a thor apparently has an all-around interest the wild and the birds and mammals it hol as well as a consuming interest in people Combining a seeing eye for all of these thin with a pleasing narrative style, Mr. Wa gives us a fascinating book, which is pu lished by Macmillan and sells for $3.50.

## The Garden Omnibus

Garden enthusiasts will revel in *The Ga den Omnibus,* a volume that is imposi both in the size and diversity of its co tents. Over the years the magazine *Hortic ture,* publication of the Massachusetts Hor cultural Society, has published an immen amount of valuable material. Now, under t direction of its editor, this material has be sifted, organized, given added illustrati and assembled between covers. It is impos ble, in the space available, to suggest even small part of what is in this book. Edit E. I. Farrington has, however, done a ma terful job and garden lovers will do we to seek this volume at their book dealer The publishers are Hale, Cushman ar Flint, who modestly fail to indicate wheth they are located in Timbuctoo, Kamchatka Boston. Also the price seems to be a secr so far as the book or its protective cover a concerned.

## Minnesota Birds

For some twenty years Dr. Thomas S. Ro erts has prepared bi-monthly season repor for *Bird Lore.* These records not only ha recorded facts on the habits, distribution, ar migration of many species of birds, but ha contained many other valuable data of seaso al and natural history value. These repor have now been gathered into a single volun entitled *Logbook of Minnesota Bird Lif 1917 to 1937,* and published by the Unive sity of Minnesota Press. The book is brougl out in a limited edition of 500 copies, abo one hundred of which will be presented to t bird students who aided Dr. Roberts in su plying the records and notes. Dr. Roberts professor of ornithology and director of t Museum of Natural History at the Universi of Minnesota. He is author of the splendi *Birds of Minnesota.* Copies of the *Logboo* are available at $2.50 each from the Unive sity of Minnesota Press, Minneapolis.

Diana Thorne's

# DOG COLUMN

## MORE DOG DON'T'S

DON'T jump to hasty conclusions about your dog if, on occasion, he misbehaves. That he may snap or froth at the mouth is no proof that your dog is mad or has rabies. That he seems out of temper for a moment is no proof that he is "vicious" or "bad-tempered." Find out what has distressed or angered him. Do so quietly, without fear and without fuss. The best-tempered dog is no more resistant to provocation than you are. If your dog is out of sorts, it may be because of heat, distemper or sudden pain. He may have chewed soap. He may have been stung. Half the mischief in the world is due to lack of thought; the other half to lack of understanding.

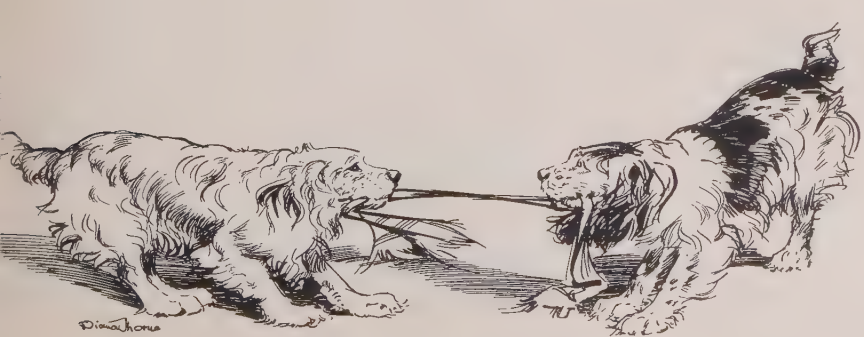
DON'T, under any circumstances or provocation, thrash your dog. There are other ways of showing your dog that you dislike his behavior and of teaching him not to repeat his offense. Don't lose your temper and, in the heat of anger, punish your dog.

DON'T leave your dog alone for long periods in your apartment, and, on your return, expect to find everything perfect. He was as bored as you would have been.

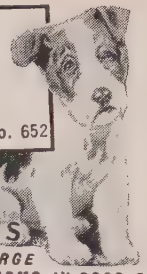
DON'T forget that a dog is a dog and not a hen. You may not like it when he lingers around lamp-posts and hydrants, but these investigations are necessary to a dog's enjoyment of life.

DON'T encourage your dog to sit on chairs or couches. It is an easy matter to let him do so once and plan to stop the practice afterwards. Put him off and KEEP him off the FIRST time he tries to hop up. Then you will never have to check him again. He should have his own chair or basket or, if a large breed, his own private corner.

DON'T take the attitude that because you can buy and sell a dog and have the power of death over him, he has no "rights" of consideration. Study his temperament and requirements as you would expect your own to be studied and respected. This is not only a decent course but a wise one. (To be continued)







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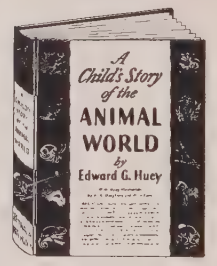


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## New Reptile Book

There are more fallacies and superstitions connected with reptiles than with perhaps any other form of animal life, so there appears to be a definite need for a popular general work like *Strange Reptiles and Their Stories,* by A. H. Verrill. Particularly is this true of snakes since there are few works of a scope dealing with and endeavoring to distinguish between the many useful and beneficial and harmless species, and those definitely known to be venomous. Then, too, there are a great many people who regard practically all forms of reptile life with loathing, or even positive fear, and a work of this kind tends not only to quiet unnecessary qualms but quickens interest in and encourages study of some of the least known and least understood of the more common animals. The author has tried to point out all the more attractive features and attributes of reptiles and batrachians, and to do away with much misinformation and utter nonsense that has gained currency regarding them. A study of this work reveals that the majority of reptiles are innocuous and that some of them are among mankind's real friends in destroying vermin, insects and other pests. Then, too, many of them are interesting in their life history and habits, and a few are even fascinating. Among the subject subdivisions considered are such as: friendly serpents; giant snakes; flying reptiles; strange ways of lizards; living dragons and dinosaurs; man-eating reptiles; reptiles of the seas; reptile life of ponds and streams; batrachians of ancient times. Included therewith the author has given items gleaned from his own personal experiences and adventures in many lands over a period of over forty years of scientific exploration. The book is published at $2.50 by the L. C. Page & Company of Boston. Dr. Verrill is also author of other books of natural history interest, particularly on birds, shells, and jungle exploration.

## Tree and Shrub Key

In *The Identification of Trees and Shrubs* have been compiled accounts of about 1300 of the 1832 trees and shrubs belonging to 552 genera, and comprising most of the species native to the British Isles or cultivated there. It is noteworthy that of those treated, 29 percent are natives of China or Japan, 21 of North America, 20 of Europe, 7 of the Himalayas, 6 of New Zealand, 5 of South America, 4 of northwest Asia, 3 of Australia or Tasmania, and 1 percent of Africa. The book is thus of interest to plant lovers of widely differing parts of the earth.

The book consists of two parts, Diagrams and Descriptions. In the first part the drawings are roughly arranged according to the shape of the leaves. This treatment, while intended mainly as a help to the amateur student, usually groups the species according to natural relationships.

In the descriptive part, where the brief characterizations are intended to be used in conjunction with the diagrams, the arrangement is by families, genera, and species. An index serves to locate the plant to which one has been guided by the illustrations. Explanations of all terms are given. Under each specific description is given the scientific and common name, color of flowers and fruit, and native habitat, and other details. There is a good index.

*The Identification of Trees and Shrubs,* by F. K. Makins, was first published in 1936 by J. M. Dent and Sons, Ltd., London; it was reprinted in 1937. It is obtainable from E. P. Dutton and Company, New York City, at $4.00. E. A. P.

## Do You Love Pinks?

If you answer the question above in the affirmative you will find that *The Garden of Pinks* by Liberty Hyde Bailey is on your list of books you must buy. Dealing both descriptively and culturally with these charming garden residents, the book draws upon the immense horticultural knowledge and experience of its distinguished author. It is a companion book to *The Garden of Gourds.* The volume is published by Macmillan and sells for three dollars.

## About Indian Chiefs

Albert Britt, former president of Knox College, is the author of an interesting volume of biography entitled *Great Indian Chiefs.* Following a chapter on the tragedy of the Indian, one of our American records for which we must eternally blush, the author writes of the lives of King Philip, Joseph Brant, Pontiac, Tecumseh, Black Hawk, Sitting Bull, Captain Jack and Chief Joseph. It is a fascinating volume. The publishers are Whittlesey House and the price is $2.50.

## Butterfly Books

For the benefit of those who have desired information concerning recently issued, worth-while books for reference use in their butterfly clubs this summer, we are glad to say that there are available several good works of this type. Notable among these are *How to Know the Butterflies,* by John Henry and Anna Botsford Comstock, late of Cornell University (Comstock Pub. Co., Ithaca, N. Y., $3.50). This volume contains a general account with simple classification keys to various groups, and with 45 plates reproduced from life in full color, and is particularly useful for study of those species that occur in the eastern United States. *The Butterfly Book,* by W. J. Holland (Doubleday Doran, N. Y., $10.), recently has been revised and enlarged, and shows 1795 butterflies, caterpillars, and chrysalids in full color, also 60 in halftone and 198 line drawings. It discusses fully life history and habits, and tells in detail how to collect, prepare and preserve specimens. It includes North American butterflies from the polar regions to the Gulf of Mexico. *The Butterfly Guide* (Doubleday Doran, $1.25), also by th same author, is a compact guide to the Ame ican butterflies fully illustrated in colo Two hundred and twenty-five species are pi tured and described for ready identificatic in the field, and it is indexed both by con mon and by scientific names. *The Butterf and Moth Book,* by Ellen Robertson-Mill (Scribners, N. Y., $2.50), contains person studies and observations of the more famili species, and is profusely illustrated wit half tones and black and white drawings b the author and others. It is an excellent po ular presentation of the whole subject an for several years has been one of the stan ard works in its field.

## Knowing the Insects

First published as a biological survey pul lication of the Iowa Academy of Science *How to Know the Insects,* by H. E. Jaqu of Iowa Wesleyan College, has met wit an enthusiastic reception. Two printings i 1937 have been followed by a fourth prin ing this year, the latest edition being a r vision of the earlier text. Containing pra tical suggestions on the best places for co lecting insects and preserving specimens, th book presents a key to identification and a excellent index and glossary combined. It available from Professor Jaques, 709 Nort Main Street, Mt. Pleasant, Iowa, for on dollar in a spiral binding and $1.80 in cloth binding.

## A Magnetic Book

Sent out by the Carnegie Institution c Washington to study earth magnetism fro the vantage point of equatorial Venezuela an Brazil, Earl P. Hanson not only brought bac the facts he sought but material for a trav and adventure book. This is entitled *Journe to Manaos* and is the story of his experience the peoples he encountered, the flora an fauna observed and other details of real ac venture. An entertaining book, it is notabl well-written. The publishers are Reynal an Hitchcock; the price three dollars.

## Pacific Coast Trees

*Forest Trees of the Pacific Coast,* b Willard Ayres Eliot and G. B. McLean, is a excellent guide to the western trees, togethe with consideration of their economic im portance. Well-illustrated, the volume shoul be a valuable reference book for school libra ries, forestry students and all interested i trees. It is published by G. P. Putnam's Son and sells for five dollars.

## Cyclopedia of Fruits

Written for fruit growers, nurserymen students, county agricultural agents and frui buyers, *Cyclopedia of Hardy Fruits,* by U. P Hedrick, has become a standard work Changes due to the development of new varieties and the accumulation of added in formation have made a new and enlarged edi tion necessary. Such an edition has now beer brought out by Macmillan. Illustrations have also been added. This splendid volume sell for six dollars.

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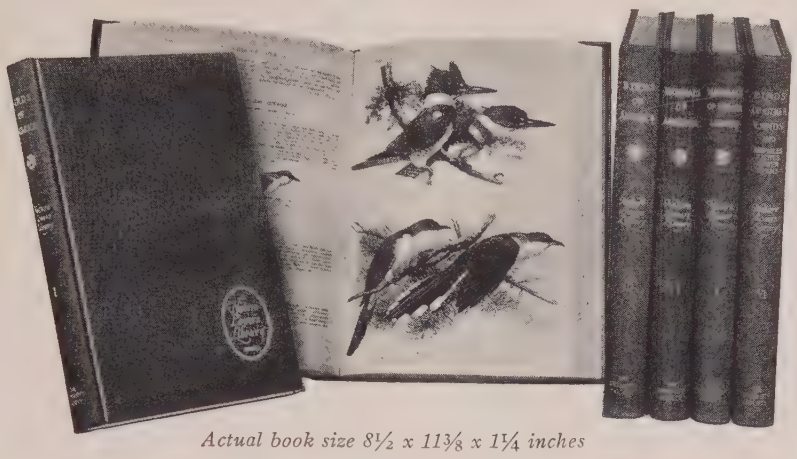

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## INDOORS AND OUT

(Continued from page 391)

with the plain miracle of what is, and make no further clamor, we will remain restless, froward, dissatisfied. True religion consists in a simple worship of life without stipulations." Among human creatures whose greatest concern has always been related to religion, all these contemplations heighten the importance of a close relation to natural influences held sacred from ruthless and profane human changes. Mr. Powys says that "in the last analysis religion can be defined as a heightened awareness of the poetry of existence. However materialistic our views become, it is consoling to know that we can never be deprived of the charmed prerogative of this devotion." And such consolation, it seems, is sorely needed if and when views do become materialistic. It is thus a common need for all of us to cherish our bits of Nature, not only as something affording recreation but also as something conducive to, if not an object of, worship. Mr. Williamson relates an incident in his neighborhood that involved simply the pruning of an ash tree, yet the branch that was taken away was the singing place of a song-thrush that delighted the neighborhood and gave the owner of the tree more pride than did the tree itself—and more prestige among his neighbors. After the tree was pruned, the song-thrush established its singing place in a far-away woods. This incident has the force of an allegory.

I consider it one of the happiest of coincidents, and an example of the enrichments of the life of a reader, that the books of John Muir, Edward Wilson, Kenneth Williamson, and Llewellyn Powys have all recently come my way. I commend them with some of the zeal of an advocate of a cause, a cause that they all serve to advance. And they all are rich in browsings for notes on August and September.

*John of the Mountains: Unpublished Journals of John Muir,* edited by Linnie Marsh Wolfe (Houghton Mifflin Company, $3.75), does not alter in any essential way one's understanding of Muir. It is simply more of an incomparably good thing—440 pages more, with an index, a series of introductions by the editor, and illustrations from photographs, some of them of dra ings by Muir. None will knowingly w to miss these journals, and all who re them will, I think, be decently curious ab the journals of Muir's foreign travels, wh it was impossible to include in this o volume publication.

*Edward Wilson: Nature Lover,* by Geo Seaver (E. P. Dutton & Co., Inc., $3) c sists of 214 pages of selections from W son's diaries and letters, with small-t comments here and there in the text Seaver. Mrs. Wilson in a foreword mal it evident that one of the main purposes the volume is to make her husband's c ored sketches and drawings available, a these are indeed more than illustratio There are 17 color plates and 50 drawir in black and white which rival the text value and interest, and this I consider hi praise. The book is indexed.

*Earth Memories,* by Llewellyn Powys (W. W. Norton & Co., Inc., $2.75) is literatu of the highest belletristic order—no illu trations, no index, but 284 pages of pr that has all the qualities that one can wi for, and in a richly manufactured volun I am inclined to agree with the publishe that it is "a book which will live—a bo not for a single season, but for the years For, besides the pleasures of its style, affords its readers the enrichment of e perience that comes when a great and sen tive mind considers in high seriousness t things that touch us all. The first essay an eloquent record of Mr. Powys's strugg against tuberculosis, tightening one's ov grip on life and heightening one's appreci tion of the deliberative exuberance and e altation of the other essays in the volum There is an interpretive introduction by V Wyck Brooks.

*The Sky's Their Highway,* by Kenne Williamson (Dodd, Mead & Compan $3.50) would be an ideal book to have wa ing in the library for the return in Septe ber to one's own landscape, for it demo strates the possibilities of wildlife ne home. From the edge of a moorland with ten miles of the manufacturing city of Ma chester in Lancashire, England, Mr. Wi liamson could survey nearly all of the sce of his book. Yet he presents what I consid one of the most satisfying and accomplish books that have come my way—a mod worth considering by anyone who wishes write about birds and produce literature. Th book's 391 pages are meaty with inform tion that is readily available with the hel of an index that, for instance, includes 3 references to the song-thrush, under the fo lowing entries: behavior, feeding, fightin movements, owl-baiting, ringing [we Ame icans say "banding"], young. The book i self, however, is a continuous account—n of Mr. Williamson's observations, but of th birds and other wildlife that he observe Through it all runs the story of Nyctalop a tawny owl that when young and wounde received surgical attention and lived on th premises in a cage until released by M Williamson when a mate called the ow back to the wild. Most of the creatures a personified, not in the bedtime-story fashio but with a dignity that serves to reveal the individuality. There are highlights th emerge on second reading as independe essays—"The Dawn Chorus", "Haymaking and "Odyssey of Snowy Owls", for instan —but even these are essential parts of th main narrative.

## Birds and Radio Aërials

A tanager, a warbler and a junco having collided fatally with our low aërial, and having seen at a neighbor's a young flicker with broken back and an evening grosbeak with torn wing muscles, the results of similar collisions with other higher antennae, I endeavored to devise some method of safeguarding our aërial to prevent such casualties. Such a method would, if widely applicable, need to be both inexpensive and capable of being easily and quickly attached. Both of these requirements I have met, and, after two years of use, no further avian fatalities or injuries have occurred.

If two-inch lengths of electrician's tape are folded over the antenna wire, adhesive side in, and stuck together, making one inch tabs along the line, the result will be, I feel sure, gratifying to both birds and radio fans. The tabs may be stuck on the wire every foot and a half along its entire length. The eye of a swiftly approaching bird is readily caught by the more easily discernible tabs of tape along the small wire, and these, in turn, attract the bird's attention to the aërial itself. The tape is cheap and durable, and may be depended upon to remain in place for several years.—J. B.

## Relative Interest

Every few years the Boston Society of Natural History makes a survey of the books most frequently borrowed from its library as a means of determining trends of interest. Four years ago insect books were in first place. This year they dropped to fourth. Birds retained second place but geology climbed spectacularly from seventh place to first. It was found that general natural history books showed a decided increase, and zoology and biology books a corresponding decline.

## Michigan Birds

Containing as complete a list of Michigan birds as present data affords, *Check List of Michigan Birds* by Dr. Josselyn VanTyne has been published by the Museum of Zoology of the University of Michigan. It is available for twenty-five cents. The status of each bird is given as far as it is known. Much information is news, even to the more profound bird students. In several instances the house wren and song sparrow, different subspecies, are noted for different parts of the State, the eastern form of neither of these being found.

## Humane Trap Prizes

Prizes totalling more than six hundred dollars have been awarded to inventors and trappers in the annual humane trap contest sponsored by the American Humane Association. A special award was made this year to Vernon Bailley for his untiring work on humane traps.

## Interested in Insects

James Sweeting, who lives at 3095 Coleridge Road, Cleveland Heights, Ohio, is a young man actively interested in entomology. He would like to correspond with others having a similar interest.


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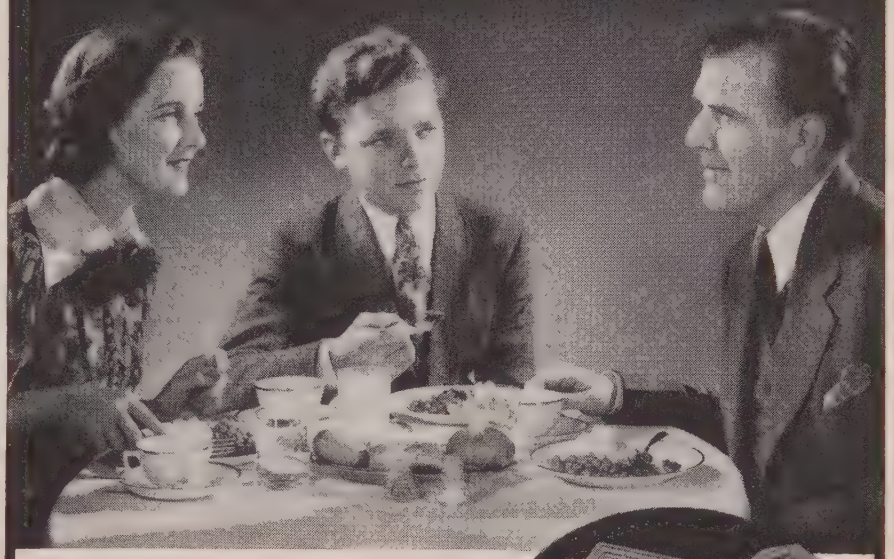

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# Photographic Notes

BY SAMUEL BROWN

A PHOTOGRAPH BY DICK WURTS THAT TELLS AN OCTOBER STORY. SUPERPAN FILM, F11, 1/25 OF A SECOND, LIGHT YELLOW FILTER

## Autumn Photography

With the coming of October and the arrival of autumn, the most colorful season of the year has come to remain with us for a short period, and to present some of the most lovely photographic opportunities of the year. The amateur photographer should keep his camera handy to take with him on autumn hikes. A tramp in the woods will immediately indicate the value of having a camera ready and loaded with Panchromatic film to record the beautiful scenery certain to be encountered.

During autumn, the light is weaker than during the summer, and longer exposures are necessary. In order to make snap-shooting possible, a faster film is recommended. This should have Panchromatic qualities so that it will be able to record the various hues in autumn foliage. A medium fast film is the most desirable, and such emulsions as Super-Sensitive Panchromatic and Superpan films are most desirable.

Although the light is strongest during the middle part of the day, the best photographic opportunities are presented just previous to and immediately after the middle hours. Here we have a most attractive sidelight that enhances and accentuates the beauty of autumn scenery.

For all ordinary pictures the camera should be used in conjunction with a yellow filter. This will correct fully for all the colors so that the reds, oranges, and browns of the leaves will be recorded in their proper tone values, and contrast favorably with the sky and clouds.

Besides the lovely scenery that is prevalent, this month offers an excellent opportunity to photograph mature nuts, acorns, pine cones and such. They should be photographed against a neutral background that will not detract too much from the subject. These subjects also are best photographed on branches.

During the whole year there is no more favorable opportunity to start taking color pictures than during this season. Practically all limitations for color photography have been removed. Kodachrome film is available for those cameras using 35 MM film, while cameras taking larger sizes may be loaded with Dufaycolor film, which is available in most amateur sizes, rolls and film-packs. For those cameras that may be used with cut film only, a color film is available in this form in practically every size.

For ordinary scenery, the procedure for color pictures is much the same as for black and white. Exposure, however, is about three times as long as the Super-Sensitive Panchromatic emulsions mentioned above. Because color film has so little latitude, the exposure must be critically accurate, and heavy shadows should be avoided. Front lighting should be used whenever possible, and this should be as flat as can be conveniently obtained. If deep shadows are very obvious, these should be lighted with the use of a reflector. This may be a white sheet, or cardboard, or even a small silvered screen. This will be found especially useful where photographs are made of autumn flowers.

Some excellent subjects for color photography are individual, beautifully-colored leaves, and the autumn wild flowers that grow by the roadside. Some beautiful trees against a clouded sky make an excellent composition. Great care should be taken to avoid extreme color contrast that will make the picture look harsh.

* * *

## Printing

In the past several issues we have discussed means for making prints, and the proper procedure has been outlined. After the prints are made they must be dried, and there are several methods. After drying, the prints may be toned to make them more attractive. This month we discuss the methods of drying and sepia toning, and also discuss the correction of some of the difficulties that are encountered along the way.

A very convenient item is a photo blotter roll. This blotter roll consists of a cloth-surfaced blotter, a plain blotter and a corrugated cardboard. The damp prints are laid face down on the cloth-surface blotter, covered with the plain blotter, rolled up in the corrugated cardboard, and fastened with a string or rubber band. The roll is then stood up on end on top of a radiator where the prints will dry quickly in winter. In summer, the roll may be laid on one side with one end facing the window. Prints dried in the roll come out smooth and have a slightly outward curve. When making glossy-surfaced prints, it is necessary to ferrotype them. Ferrotype tins are of two designs, black enamel and chromium. The latter is more durable, will last longer, and assure a higher gloss. Before using, ferrotype tins should be carefully washed with soap and hot water, after which they are polished with a solution of beeswax and benzine. The wet prints are then placed face down on the ferrotype tin and rolled into close contact with a rubber roller. If the tin is then placed in a current of air, the prints will quickly dry and peal off by themselves, brilliantly glossed.

If chromium tins are used, they may be dried over a warm flame. This should not be too hot, or the prints will dry unevenly and come off out of shape, or, in some cases, not fully ferrotyped. It is essential that tins be meticulously clean before ferrotyping. If not, the prints may stick on and be ruined. Care must also be exercised, when squeegeeing, not to crush them. The plates should always be washed with hot water after using to remove any particles of gelatin that may remain.

Some prints may be made more attractive by sepia toning. This is done with a solution that changes the black image to a pleasant deep brown. Appropriate subjects are landscapes, autumn scenes, and some portraits. Subjects such as seascapes and snow scenes are best left black and white. Sepia toner may be purchased in ready-mixed form, and this is recommended in preference to mixing your own solution. For the amateur who wishes to make his own sepia toner, however, we recommend the following formula:

*Number 1*—Stock Bleaching Solution: Potassium fericyanide, 2½ ounces; potassium bromide, 2½ ounces; potassium oxalate, 6¼ ounces; acetic acid (28%), 1¼ ounces; water, 64 ounces.

*Number 2*—Stock Re-Developing Solution: Sodium sulphide, 1½ ounces; water, 16 ounces.

For use, dilute as follows: For bleaching

bath, use stock solution No. 1, one part; water one part. For re-developer, use stock solution No. 2, one part, water eight parts. The print to be re-developed should be washed thoroughly.

Place it in the bleaching bath (65 degrees F.) and allow it to remain until only faint traces of the half-tones are left and the black of the shadows disappeared. This will take about one minute. Rinse thoroughly in clean water. Place in re-developing solution (65 degrees F.) until the original detail returns. This will require about 30 seconds. Remove the print from this bath and wash for at least one-half hour in running water.

Good prints are made by careful attention to all the details described above.

If the print is too dark, it is due to either

AUTUMN ON THE FARM. PANATOMIC FILM, F.8, 1/50 OF A SECOND, EARLY AFTERNOON

over-exposure, over-development, or too warm developer. In some cases this is also due to a negative that is too thin, or to not using paper of the proper degree of contrast. If the print is too light, and lacks detail, it is due to under-exposure, under-development, or too cold developer. Fog, which is a general gray over the whole print, is due to an unsafe safe-light or to too long development.

Stains come from using an exhausted or oxidized developer. Never use the developer after it has become discolored, or after it is too warm. Stains are avoided, also, by keeping the prints constantly in motion while fixing. If the print is not placed in the developer evenly, it will develop more quickly on one side than on the other. Round white spots are caused by air balls on the surface of the paper during development. To avoid this, develop the print, face up, immediately, brushing off with the finger any air balls that have formed. Also use sufficient developer to cover the print.

One of the most important things in any photographic process is cleanliness. Particular care should be taken to wipe the hands when transferring them from one solution to another. This is especially important when the hands have been in the hypo solution, since they are sure to contaminate the developer if the hypo is carried over. It is wise to have a tray of clean water and a towel always handy so that the hands may be rinsed and dried before placing in the fixing solution. Always be sure to clean all trays and other apparatus after finishing the evening's work, so that it will be ready the next time you want to do some work. Always rinse trays before using.

After one or two experiences with printing, the amateur will be delighted with the work he can turn out. It is simple and offers many pleasant evenings' work. Much pleasure is derived from contact printing, and, with the acquisition of experience, some excellent and unusual film work can be accomplished.

* * *

## Trade Hints and New Books

The latest Kodak catalog is now available. This new booklet is the most interesting edition yet. It is illustrated with a number of colored pictures together with many in black and white. The book forms an excellent directory of modern cameras, showing the latest models, such as the new Super Kodak Six 20 and the recently introduced Bantam models. Available without charge from this department. Please send 3c for postage.

* * *

The most revolutionary forward step in camera design has just been made by the Eastman Kodak Co., Rochester, N. Y. This organization now announces the new *Eastman Super Kodak Six 20.* Automatic in almost every respect, it leaves the photographer free to concentrate on his subject and composition while all other mechanical steps are almost automatically accomplished. The combined range and view finder instantly enables the setting of the focus and viewing the field while the built-in photo electric cell exposure meter *automatically* sets the diaphragm at the proper opening for the shutter speed which has been pre-set. The camera has many more features far too numerous to mention. Write to the manufacturers, or to this department, for full information.

* * *

E. Leitz, Inc., 730 Fifth Avenue, New York, N. Y., announce a handy darkroom accessory known as the *Enlarging Paper Box.* This box is light-tight and is arranged to hold several different sizes of paper. After a sheet is removed, the spring-actuated cover of the box jumps back into its original light-tight position thereby protecting its contents from any light inadvertently turned on. Further information from E. Leitz. Please mention NATURE MAGAZINE.

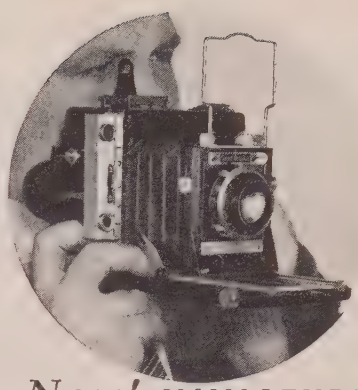
* * *

A new motion picture camera, magazine loading, has just been announced by the Bell & Howell Co., 1801 Larchmont Ave., Chicago, Ill. The Filmo 141, as the new camera will be known, incorporates features not usually found on this type camera, such as projected area view finder, four camera speeds and single frame exposure device, interchangeable lenses, critical focuser and many more. Bell & Howell will be happy to send full information if you mention NATURE MAGAZINE.

* * *

Since the introduction of color films, slides have come into vogue and many devices have been invented for viewing them. One of the best to make its appearance up to the present time is the *Film Slide Viewer*

(Continued on page 453)

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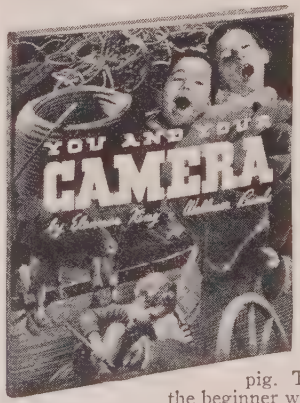
## You and Your Camera

Eleanor King and Wellmer Pessels




The perfect handbook for the amateur who may not have expensive equipment. Here is a picture of the moon taken through a street telescope. Here are pictures of pigeons, baby owls, a flock of sheep, a close-up of a pig. This book tells the beginner what he needs to know from the artistic point of view—not how to take but what to take. Illustrated with many photographs. "A Splendid 'how' book for all picture-snappers." *Young America.*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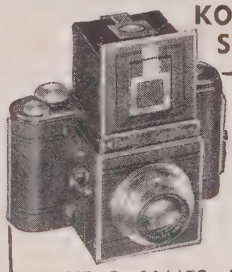

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# NATURE MAGAZINE

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To Stimulate Public Interest in Every Phase of Nature and the Out-Of-Doors, and Devoted to the Practical Conservation of the Great Natural Resources of America

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## PHOTOGRAPHIC NOTES

(Continued from page 451)

manufactured by Bausch & Lomb, Rochester, N. Y. The manufacturers will be pleased to supply descriptive material, or you may see the *Film Slide Viewer* at your dealer.

* * *

MINIATURE CAMERA WORK, *edited by Morgan & Lester, 310 pages, 500 illustrations, 20 color photos. Published by Morgan & Lester, 100 E. 42nd Street, New York, N. Y. Price $4.00.*

The well-known publishers of the Leica Manual have again turned out what is destined to be a best seller in *Miniature Camera Work*. This book incorporates, between its covers, the cream of photographic knowledge. Each chapter is written by an expert in the field in which he is best known. A list of the contributors' names forms a Who's Who in the photographic world. Leo Pavelle contributes "Photography of After Dark Entertainment"; Alan Fisher "News Photography"; Douglas Haskell "Photography of Children and Pets"; Augustus Wolfman "The Miniature Camera Club", and many more tempting titles by outstanding photographic writers. A chapter deserving special mention is "Color Photography" by Harris B. Tuttle. Being the most comprehensive discussion of picture making with Kodachrome and illustrated with 20 color pictures, this chapter will lead the way to better photographs in natural color. The user of the big camera as well as the miniature camera worker needs "Miniature Camera Work" in order to acquaint himself with the latest and best in photography.

* * *

COLOR PHOTOGRAPHY FOR BEGINNERS *by R. M. Fanstone, Camera Craft Publishing Co., 425 Bush Street, San Francisco, Cal. Price $1.50.*

With the ever increasing popularity of color photography, a book for the beginner has obviously been lacking. Mr. Fanstone has provided us with an understandable text that will lead the amateur through the first steps to accomplished color technique. Obviously avoiding complicated data, the book discusses only essential and necessary details. If you want to join the ranks of satisfied amateur color photographers, add *Color Photography for Beginners* to your library.

* * *

The photographic department of NATURE MAGAZINE is edited for its readers interested in photography and maintains a service that renders assistance with any photographic problem. You are invited to take advantage of this service. Address all photographic inquiries to Samuel Brown, NATURE MAGAZINE, 1214 Sixteenth St., N. W., Washington, D. C.

Cordially,
SAMUEL BROWN.

---

### Whip-poor-will Calls

One untiring whip-poor-will gave 268 calls without a break, reports Arthur F. Musgrave of Truro, Massachusetts, who also ventures the opinion that the call of this bird is "Good Morning, Good Morning", or "Don't Worry, Don't Worry". Mr. Musgrave also finds amusing the fact that late in the season the birds get a little hoarse and in poor voice.

# LOOKING FORWARD

### Are We So Superior?

We higher mammals are inclined to think we are the only ones provided with the nobler virtues—courage, fortitude, perseverance and others. In the November NATURE MAGAZINE Archibald Rutledge writes of "Wild Gallantry"; of things that have happened in the world of the wild to make Man wonder if he is such a superior development, after all.

### Insect Strong Men!

Many people, no doubt, have seen ants dragging things many times their size and weight and wondered. Many insects have a muscular development and coordination that is amazing. They can perform surprising feats of strength, in proportion outstripping Man. S. F. Aaron tells of some unique studies among the insects in this field.

### Are You Florida Bound?

If you are, one of the strange and interesting trees you will see is the mangrove, a tree that has learned to live in salt water; to put out long strange roots from its very trunk to find attachment in underwater soil; to cast its seeds upon the waters to carry on the race in a strange way.

### For the Little Museums

Science and Nature Study rooms are now a part of the majority of schools. They have their exhibits of specimens but they may be like the big museums in a small way through simple and inexpensive means. Paul Howes of the Bruce Museum tells how this may be done in a fascinating, practical article next month.

### Also—

All about our British bird cousins, with beautiful pictures; wildlife sanctuaries in Wisconsin; the family life of Mr. and Mrs. Fish; banding the strange roseate spoonbill; the saga of Lizzie, a circus lizard; shells of sea and beach in pictures, and the regular microscope, astronomy, photographic and dog departments.

* * * *

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# Indoors and Out

*By* HOWARD ZAHNISER

WILLIAM HAMILTON GIBSON's biographer—John Coleman Adams, himself an outdoor writer—said, at the turn of the century: "Three men have done more than any others to inspire our generation with the love of Nature. They are Henry David Thoreau, John Burroughs, and William Hamilton Gibson." Today there are, comparatively speaking, only a reminiscent few who recall "the Gibson books." Yet their intrinsic value, as well as their significance to an earlier generation, makes it seem worthwhile to use the accident of Gibson's birth in October (October 5, 1850) as an occasion for exploring again the delights of these unique contributions to America's outdoor literature.

It is probable that the very same things that resulted in Gibson's immense popularity in his own day explain the neglect of his works by this later generation. His books are *de luxe,* in the publishing taste of the late Nineteenth Century, and Gibson's own illustrations are their prominent features. Gibson was an artist before he was a writer, at a time when improved engraving and printing processes made possible an heroic last stand of the engraver as illustrator for the periodical press. Photographs were already on the road to their more recent triumph. Gibson's distinctive illustrations rivalled photographs in their essential accuracy, but bordering many of his scenes and extending out from others there were fanciful decorations handled in a manner that now seems quaint and sometimes ornate, although the particular parts of all these were careful representations of the insects, flowers, birds, and other creatures that Gibson had observed so accurately. These illustrations were spread across the pages of his books, the type often being arranged irregularly to fit the engraving, and the books were in large formats and on heavy paper for the sake of the illustrator.

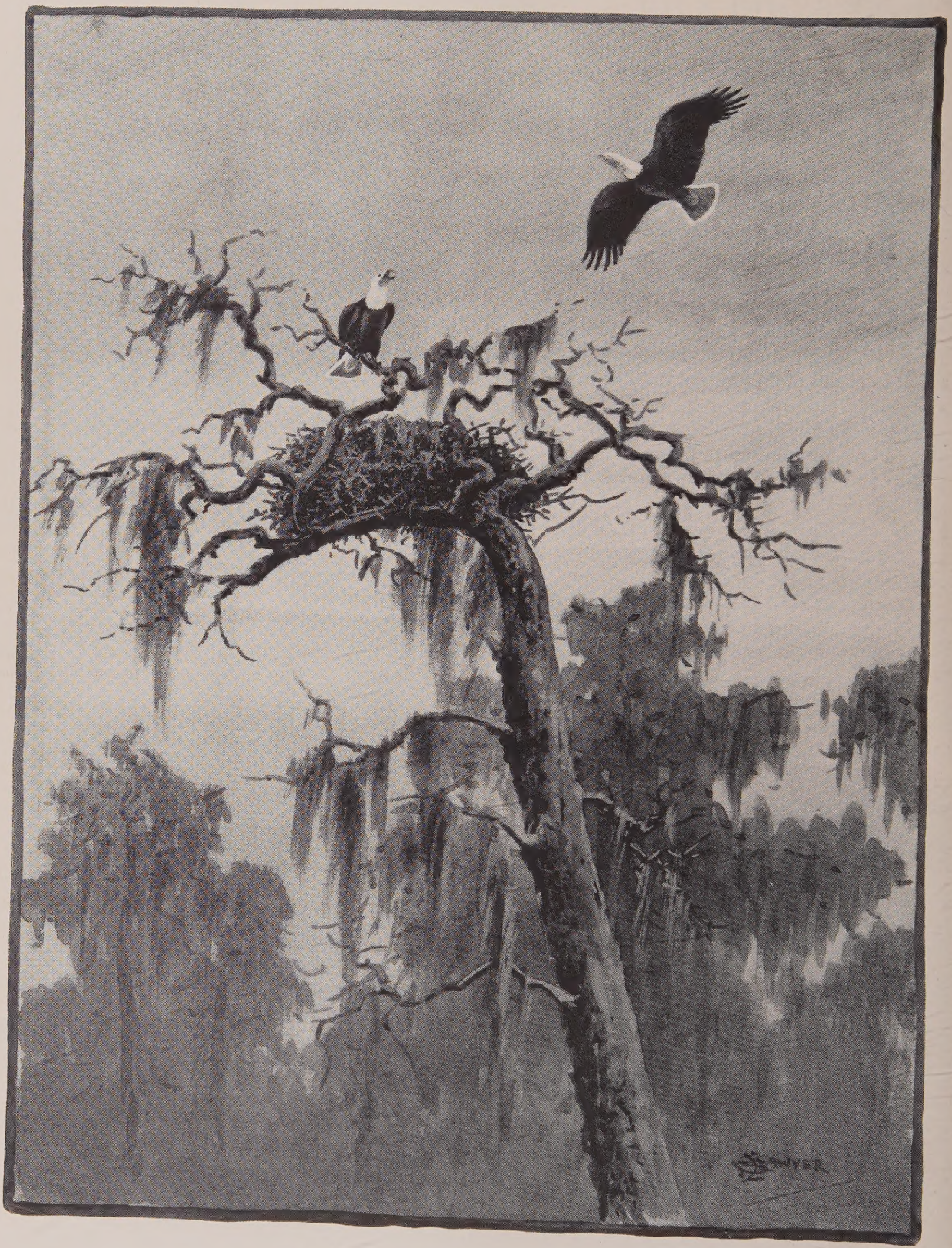
When Gibson was a young boy he once picked up a chrysalis just as the butterfly was about to emerge, and the amazing experience fired the life-long enthusiasm of a naturalist. His boyhood was spent in the pastoral Connecticut countryside around Newtown and Washington, where he attended school at the "Gunnery" in most favorable circumstances. He developed a companionship with the living things of the outdoors and a personality that later made it possible for him to take a hummingbird in his hands and on other occasions to enjoy a similar intimacy with birds and animals that would be incredible were it not for unimpeachable witnesses. He attended the Brooklyn Polytechnic Institute and on his father's death in 1868 became an insurance agent, but this straying from destiny was soon ended when in the course of his business rounds he chanced to see an engraver at work. Gibson himself had drawn "pictures" in his boyhood. His grandmother had forced him to develop skill with his fingers in order to sew and make patches for quilts. Within a few months after he left the insurance business he was an accomplished self-taught artist, and by the time of his early death (on July 16, 1896) he was well known as a water colorist as well as a designer of engravings and was beginning to take a more serious interest in oil painting.

After hearing Gibson's account of summer vacation experiences, the editor of *Harper's Magazine,* for which Gibson was an illustrator, suggested that he himself write an article and illustrate it. The result was that he wrote three other such articles—featuring seasonal interests in spring, autumn, and winter—and these four articles were promptly collected in a book, *Pastoral Days, or Memories of a New England Year,* published in 1881. Gibson had published an earlier book for boys on trapping and camping, but *Pastoral Days* made him a successful author. It was immediately acclaimed by critics, became popular, and was followed by others prepared as fast as Gibson could carry out the painstaking work of providing illustrations as well as text—*Highways and Byways, or Saunterings in New England* (1883), *Happy Hunting-Grounds, A Tribute to the Woods and Fields* (1887), *Strolls by Starlight and Sunshine* (1891), *Sharp Eyes* (1892), *Eye Spy, Afield with Nature Among Flowers and Animate Things* (1897), and *My Studio Neighbors* (1898).

Gibson also wrote a book entitled *Our Edible Toadstools and Mushrooms and How to Distinguish Them,* published in 1895 with 30 color plates from Gibson's water colors and 57 other illustrations. In 1905 *Our Native Orchids* appeared, described as a series of Gibson's drawings of all the species found in the United States, with descriptive text elaborated from his notes by Helena Leeming Jelliffe. For school use a book of selections was published in 1901, *Blossom Hosts and Insect Guests,* described as "an exposition of the method by which flowers are fertilized, a subject which Mr. Gibson was the first American to investigate." In 1913 another book of selections was published as a supplementary school reader, entitled *Secrets Out of Doors.*

Gibson's illustrations were outstanding features of many books by other outdoor writers. *Nature's Serial Story,* by E. P. Roe (and this incidentally is the famous clergyman-novelist's centennial year) was one of these, and the author in his preface "consoled" himself for any of his own shortcomings with "the thought that my text has proved the prosaic root and stem which have given being to the exquisite flowers of art that adorn these pages." There is an excellent series of drawings of flowers by Gibson in a book of poems by Elaine and Dora Read Goodale, arranged by seasons and entitled *In Berkshire with the Wild Flowers.* These drawings are forthright representations of the subjects. His illustrations in works of other writers are in manner much like those in his own books.

Any renewed or continuing (Continued on page 501)



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